# THE IRON TRADE REVIEW

Volume XLV CLEVELAND, NOVEMBER 18, 1909 Number 21

## RAILROAD BUYING

### AGAIN BECOMES AN IMPORTANT FACTOR.

**Many Car Orders—Wire Mill to be Built in the Birmingham District—Several Interests Withdraw From the Steel Bar Market.**

After a slight decrease in specifying against contracts for finished material, specifying and ordering have been resumed in large volume. Railroad buying of the week has been an important factor. Pig iron, however, continues quiet, with some indications of weakness still evident in the southern market. The pace at which iron and steel plants are being driven is shown by the fact that the Steel Corporation and its subsidiaries, in October, established 141 new records, some of them at plants which are operating only during periods of unusual prosperity. New records were also made by many independent steel interests.

**Pig Iron Conditions**

Sales of basic pig iron include 35,000 tons in the east at between $18.50 and $18.75, delivered, 12,000 tons in the Pittsburg district at $17.50, valley, and 4,000 tons at St. Louis. It has also developed that two sales, aggregating 25,000 tons of basic heretofore not reported were made in the east at prices somewhat below recent quotations. In the south, iron bought on speculation is pressing upon the market at $14.50, Birmingham, for No. 2, and the supply seems to be greater than the demand.

**New Plants**

An unusually interesting announcement concerning new construction is that made by the American Iron & Steel Mfg. Co., Lebanon, Pa., that it will install a plant for the production of 50,000 to 60,000 tons of steel billets per annum by an electric process. The product will be consumed by the company. The growing importance of the south as a manufacturing center is shown by the announcement that the American Steel & Wire Co. will at once begin the erection of a wire mill in the Birmingham district. This company is considering the building of a modern blast furnace at Newburg, a suburb of Cleveland, to take the place of an obsolete stack.

**Price Advances**

Prices on some products are being advanced in a conservative manner. Quotations on bolts and nuts have been reaffirmed, but it is expected that an advance will be made within a month. Advances have been made on sheets of $1 on blue annealed, and $2 on black and $3 on galvanized. Tin plate has been advanced 10 cents per base box. The Cambria Steel Co. has advanced its prices on steel bars to a basis of 1.60c, Pittsburg, which is practically withdrawal from the market, and another large manufacturer of steel bars has announced its withdrawal from the market. Several of the leading manufacturers are from four to six months behind in deliveries of steel bars. No definite declaration of higher prices on material for railroad equipment has been made, the rumor having its only foundation in the moderate general upward tendency of prices.

**Railroad Buying**

Railroad buying during the past week included 10,000 freight cars by the Pennsylvania railroad; 1,000 for the Delaware, Lackawanna & Western; 500 additional for the Chicago & Northwestern, and 500 coal cars for the Northern Pacific. Several railroads have placed heavy orders for spikes, and the Lake Shore has purchased a large tonnage of bar iron to meet its requirements up to July 1. The Pennsylvania lines west placed an order for 27,000 tons of Bessemer steel rails with the Carnegie Steel Co.

## BASIC MORE ACTIVE.

**In Eastern Territory—Late Sales of Rails.**

New York, Nov. 17. (By wire.) There has been further activity in basic iron, sales aggregating 35,000 tons, being made at between $18.50 and $18.75, delivered. Heavy selling of misfit basic and of gray forge, totaling about 25,000 tons, is also reported, with some good inquiries under negotiation.

Rail sales include 13,000 tons by the Ensley mill, chiefly to the Central of Georgia, the Winston & Salem, and the Georgia railroad, and scattering lots by the Illinois and Carnegie companies, with large blocks near closing.

## WIRE MILL

**Will be Built in Birmingham District, Attached to Ensley Plant.**

New York, Nov. 17. (By wire.)

Announcement is made that the American Steel & Wire Co. will begin at once the construction of a wire mill with a capacity of 400 tons of rods per day. This will be located near Birmingham, attached to the Ensley plant and will cost about $3,000,000.

## MAY BUILD BLAST FURNACE AT CLEVELAND.

New York, Nov. 17. (By wire.)

The report that a controlling interest in the Virginia Iron, Coal & Coke Co. has been acquired by the United States Steel Corporation is pronounced without foundation.

The report that improvements costing $3,000,000 are planned for the Steel Corporation's Cleveland works has no other basis in fact than that the construction of one large blast furnace to replace one of obsolete type is under consideration.

# THE WEEK IN IRON CENTERS

## PITTSBURG.

### Heavy Specifying of Finished Products—Pig Iron, Coke and Scrap Quiet.

Office of THE IRON TRADE REVIEW,
510 Park Building, Nov. 16.

While there is a more settled movement in the market as a whole, the iron and steel industry continues to show a tremendous rate of activity. Specifications in finished lines, which displayed some easing up after the heavy October tonnage entered, have again run strongly this week. The more moderate tone in the general situation appears to be due to the greater conservatism of steel makers in booking business in finished lines rather than any decline of patronage from buyers.

The action of one large independent maker of steel bars in practically withdrawing from the market at the present time is typical of the condition of the mills in this product. The capacities of the mills continue so engaged by current orders for several months ahead that the producers are content not to be aggressive in seeking new business and are discriminating more sharply among offerings of buyers. Prices in bars, shapes and plates continue gradually to harden as the result of the more independent position of makers and the minimum quotations of 1.40c and 1.50c, respectively, while they are still retained by some companies in their range of quotations, have become virtually nominal. Today's market on bars is more fairly quotable at from 1.45c to 1.50c and on shapes and plates from 1.55c to 1.60c. Some steel bar manufacturers are nominally quoting 1.55c and report a little selling at this figure.

All the mills appear to be under a pressure for crude steel and this fact continues to hold back the adoption of definite selling policies on billets and sheet bars for next year. The acuteness of the situation is reflected by the starting this week after several years of idleness of the Bessemer department at the Homestead works of the Carnegie Steel Co. Sheet bars for immediate shipment sold in Pittsburg territory this week at $29.50, Pittsburg, and Bessemer billets around $27.50, Pittsburg. Contrary to reports, it is officially stated that sheet bar prices for next year have not been fixed by the Carnegie Steel Co. Buyers of semi-finished material are showing more concern in their efforts to cover for their requirements over first quarter and first half. The position of sheet and tin plate makers with respect to the higher cost of raw materials has been improved by the advance of from $1 to $3 a ton in sheets and $2 a ton in tin plate posted the past week.

Quietness rules in pig iron, coke and old material. Consumers appear to be well covered in pig iron and scrap and the unfilled buyers of furnace coke are holding off from closing at present prices.

**Pig Iron.**—A continuation of the quiet condition of pig iron in the Pittsburg district is still in evidence. It cannot be said there is any weakening in the general situation, but some valley makers are still disposed to shade prices to get business.

A large local steel company during the week bought through middlemen a block of 12,000 tons of basic for shipment this year at a reported price of $17.50, valley. This is the most representative transaction that has been made in this territory for some time and indicates the current strength of the basic market on tonnages which has scarcely been tested for weeks. There has been little activity in the Bessemer market outside of the inquiries of ingot mold manufacturers, who have been sounding the situation largely to develop prices upon which to base contracts for their own product. Further selling of malleable has been done at $17.50, valley.

Low phosphorus iron has had somewhat of a movement in this territory lately and several additional sales have been made this week, one interest reporting 1,500 tons. A local steel company bought a lot for first half at $22.75, delivered Pittsburg, and this is the price at which forward material in this grade has been selling in recent transactions. Some buyers have been offering $22.50 delivered. A lot of 300 tons for prompt shipment went at a lower price. A Pittsburg foundry interest is in the market for 1,000 tons for second and third quarter.

Foundry iron is especially quiet and the market continues to show evidence of the willingness of some valley makers to shade the generally quoted level. Light selling of prompt iron around $17.25, valley, is noted. On prompt iron and for shipment over the first quarter, we quote as follows:

| | |
|---|---|
| Bessemer, valley | $ 19.00 |
| Bessemer, Pittsburg | 19.90 |
| No. 2 foundry, Pittsburg | 18.15 to 18.40 |
| Gray forge, Pittsburg | 17.40 |
| Basic, valley | 17.25 to 17.50 |
| Basic, Pittsburg | 18.15 to 18.40 |

**Ferro-Alloys.**—The Carnegie Steel Co. appears no longer to be interested in ferro-manganese and as far as learned has made no additional purchases. The market appears less excited, although it continues strong. Some new local inquiry has come out. There has been some local buying of 50 per cent ferro-silicon, and two lots of 50 tons which were closed this week at about $62.50, delivered. In the lower grades of ferro-silicon, sales of several hundred tons at quoted prices are noted.

We quote ferro-manganese at from $44.50 to $45, Baltimore, prompt shipment, or for delivery this year and the first half of 1910, $45 to $46, Baltimore, or $46 to $46.50 for second half. The freight from Baltimore to Pittsburg is $1.95.

Fifty per cent ferro-silicon is quoted at $62.50 to $63.50, Pittsburg; domestic 12 per cent, $26; 11 per cent, $25; 10 per cent, $24, Pittsburg, for prompt, with $1 advance for first quarter and $2 for first half. The foreign grades are held at advanced prices.

**Plates.**—Makers of plates have so much tonnage upon their books that they are not especially aggressive for new business, and are rather more concerned with getting out the deliveries of the material already sold. This condition is manifesting itself in the strengthening of prices, and today's market may be reasonably quoted at from 1.55c to 1.60c, and the 1.50c price which is still retained by some makers in their range of quotations has become practically nominal. Boat and car builders continue to specify freely for plates, and there is steady ordering by other consumers. Considerable new business is going and the market is brisk, even though it may lack some of the tone arising from the pursuit of active selling policies. Car orders of the week include 1,000 steel general service gondolas for the Pittsburg & Lake Erie railroad and an additional lot of 500 cars for the Great Northern railroad, both awarded to the Pressed Steel Car Co. The Pennsylvania inquiry is still pending, and there is other important business expected to be awarded shortly. We quote present plate prices as follows:

Tank plates, ¼-inch thick, 6¼ to 100 inches, 1.50c to 1.60c. Extras are as follows per 100 pounds: Boiler and flange steel plate, 0.10c; A. B. M. A. and ordinary firebox steel plates, 0.20c;

still bottom steel, 0.20c; marine steel, 0.40c; locomotive firebox steel, 0.50c; all sketches, excepting straight taper plates varying not more than 4 inches in width at ends, narrowest end not being less than 30 inches, 0.10c; circles, 0.20c. Plates in widths over 100 inches up to 110 inches, 0.05c; over 110 inches up to 115 inches, 0.10c over 115 inches up to 120 inches, 0.15c; over 120 inches up to 125 inches, 0.25c; over 125 inches up to 130 inches, 0.50c; over 130 inches, 1c. Gages under ½-inch to and including 3/16-inch plate on thin edge, 0.10c; under 3/16 to and including No. 9, 0.25c. Five cents extra for less than carloads. Terms, net cash in 30 days.

**Sheets.**—A general advance of $1 in blue annealed, $2 in black and $3 in galvanized sheets has been put into effect dating from Nov. 11, when the American Sheet & Tin Plate Co. announced revised schedules. The independent makers have made similar advances in their prices and the market is now generally quoted at the new level. The advancing market on spelter is responsible for the larger increase in the galvanized grade. Considerable contracting has been done at the new prices, and with some makers delivery periods at today's quotations have been extended over the first half. Other mills are making the new level apply only to first quarter business. Specifications continue heavy and some large makers are unable to make shipment on new business in blue annealed in less than three months' time, while the situation in galvanized is not much better. The leading interest this week is operating 84 per cent of its serviceable equipment. We quote revised minimum prices as follows:

Blue annealed sheets, Nos. 3 to 8, 1.70c; Nos. 9 and 10, 1.75c; Nos. 11 and 12, 1.80c; Nos. 13 and 14, 1.85c; Nos. 15 and 16, 1.95c; box annealed sheets, Nos. 10 to 12, 2.05c; Nos. 13 and 14, 2.10c; Nos. 15 and 16, 2.15c; Nos. 17 to 21, 2.20c; Nos. 22 to 24, 2.25c; Nos. 25 and 26, 2.30c; No. 27, 2.35c; No. 28, 2.40c; No. 29, 2.45c; No. 30, 2.55c; galvanized sheets, Nos. 12 to 14, 2.50c to 2.55c; Nos. 15 and 16, 2.60c to 2.65c; Nos. 17 to 21, 2.75c; Nos. 22 to 24, 2.90c; Nos. 25 and 26, 3.10c; No. 27, 3.30c; No. 28, 3.50c; No. 29, 3.60c; No. 30, 3.85c; painted roofing sheets, $1.70 per square for No. 28 gage, 2½-inch corrugation, and galvanized roofing sheets, $3 per square for No. 28 gage, 2½-inch corrugation.

**Tin Plate.**—An advance of 10 cents per base box, or $2 a ton, has been announced by the leading maker and tin plate manufacturers in general, making the new quotation $3.60, Pittsburg, per 100-pound box. Some new buying has been done at the advanced level for delivery in the second quarter, as the mills generally have booked heavily for first quarter and can make no shipments before some time within that period. The salmon packers of the western coast continue to buy very freely for their needs, and the indications are for a very fair movement which may, however, not equal last year's heavy shipments. The operations of the American Sheet & Tin Plate Co. this week are 76 per cent of its serviceable capacity, the principal gains being made in the Sharon-New Castle district. We have revised our prices and quote as follows:

Coke tin plate, 100-pound basis, 14 x 20, $3.60 f. o. b. mill, Pittsburg district.

**Rails and Track Material.**—The Pennsylvania lines west have closed with the Carnegie Steel Co. for 27,100 tons of rails, part Bessemer and part open-hearth, for delivery next year. Of this lot, 6,100 tons will go to the C. A. & C. and the remainder to other lines west. Other important negotiations for rails are pending. Light rail bookings of the week by the Carnegie Steel Co. were 2,400 tons. Heavy buying of standard spikes has featured the week. The Baltimore & Ohio railroad made awards on its inquiry for 20,000 kegs and is believed to have placed the entire lot with different mills, and the Lake Shore closed for 6,000 kegs for first half. Some of this business is understood to have been placed at a 1.80c base. The Erie railroad is also in the market for 20,000 kegs. Spike prices are stronger for forward shipment. Small spikes are in good demand. We quote the present market on Bessemer rails as follows, the base price for open-hearth rails being $30, mill:

Fifty-pound and heavier, 500-ton lots and over, $28; carloads and less than 500 tons, $30; less than carload lots, $32; light rails on base weight of 40 to 45 pounds, $28, the schedule on the other weights being irregular and subject to negotiations; angle splice bars for standard sections, 1.50c, Pittsburg; standard spikes, 1.75c to 1.80c, Pittsburg; hand spikes, 1.80c to 1.85c, Pittsburg.

**Steel.**—The Carnegie Steel Co. officially denies the report that it has opened its books on first quarter sheet bars at $30, mill. There has been no definite action taken by the company relative to selling for next year. Selling of sheet bars continues to be limited to comparatively small lots for prompt shipment. Late transactions closed this week were for 1,000 tons of long-length Bessemer bars for immediate shipment at $29.50, Pittsburg, and 800 tons of similar material at about the same price. A lot of 750 tons was also sold this week at a price equivalent to $28.75, Pittsburg, for long-length Bessemer bars. Other sales are reported. Sheet bar consumers are showing more anxiety to close for their needs, but the mills continue very conservative in accepting business. Some consumers of billets are making inducements to get the mills to accept their business, but the latter are closely guarding their forward steel and prices are largely nominal.

Bessemer 4 x 4 billets with 0.25 carbon and less are quoted at $26.50 to $27, Pittsburg, with the usual extras for size and analysis, and open-hearth rolling billets from $27 to $27.50, Pittsburg. Forging billets are held at $29 to $30, Pittsburg. Sheet and tin bars are quoted at $28.75 to $29.50, Pittsburg.

**Hoops and Bands.**—The hoop market is now in a very good condition and some makers are sold up for several months ahead. As a rule, deliveries are less prompt. Some of the large buyers have covered for their first quarter needs and are now specifying. Little business, however, has been taken beyond the first quarter at today's schedule. Hoop prices are stronger, the current market being from 1.55c to 1.60c with 1.50c reserved for exceptional cases. Up to 1.65c has been asked of buyers outside the regular trade. The band trade is very active. We quote the market as follows:

Hoops in carload lots, 1.50c to 1.60c; in less than carload lots, 1.60c to 1.70c; bands, 1.40c to 1.50c, base, with net extras as per standard steel.

**Merchant Bars.**—One of the large independent makers of steel bars announces that it is entirely out of the market on new business at the present time, and is unwilling to enter additional tonnage regardless of price. This maker has its capacity sold up far ahead and its delivery schedule is from 22 to 25 weeks on some sizes. This case is typical of the steel bar situation, which finds the mills without any free tonnage to offer within from two to five months, and with little prospect of catching up, since specifications continue to be received in a great volume. The report that the leading maker had moved up its minimum

price to 1.50c is unfounded, as the range of the market continues from 1.40c to 1.50c, the former being the extremely exceptional price which has been made lately on some western business. The present market may be fairly stated at 1.45c on business taken subject to maker's convenience on shipments, and 1.50c on first quarter and on some first half contracts. Bar iron continues active and is strong except in some western markets. Some makers will only sell to April 1 and are doing this conservatively, generally asking a $1 advance over today's prices for first quarter. The shafting market may now be quoted at 55 and 50 for any shipment, as makers generally have followed the recent action of some of the larger manufacturers in making this price apply to both this year and first quarter. We quote the market as follows:

Common iron bars, 1.65c to 1.70c, Pittsburg; Bessemer and open-hearth steel bars, 1.40c to 1.50c; plow and cultivator, 1.40c to 1.50c; channels, angles, zees, tees, under 3-inch, 1.50c to 1.55c, all f. o. b. mill. The following differentials are maintained on steel: Less than 2,000 pounds, 0.15c advance; less than 1,000 pounds of a size, 0.35c advance. Cold rolled and ground shafting, 55 per cent in carloads and 50 per cent in less than carloads, delivered in base territory.

Planished and machine straightened tire is 1.60c base; iron finished tire under 1½ by 1½ inches, 1.55c, both plus net extra on tire card; iron finished tire, 1½ by ½ and over, 1.40c, plus net extra on the steel bar card.

On cold rolled strip steel, width 1½ inches and wider, and 0.100-inch and thicker, we quote base prices for 100 pounds, $3.20 on hard, and $3.45 on soft, except in carload lots of one size where the price is lower.

**Structural Material.**—There is not a great deal of activity in new structural jobs, but the time is closely approaching when the preliminaries on new spring projects will be brought to the attention of fabricators and shape makers. The present inquiry in the market is light. Shape prices are stronger with relation to the well-filled order books of the mills which have put back the delivery on material for new work to two months and over. The market is quotable at from 1.55c to 1.60c, mill, and the extreme 1.50c price has practically disappeared. Bids went in Nov. 16 for the 15,000 tons required for the new free bridge over the Mississippi river at St. Louis which is to be erected by the city. A new bridge project in this territory is that of the Huntington & Northern railway across the Ohio river at Huntington, W. Va. Bids will be taken Nov. 20 on 500 tons for a new medical building for the University of Pittsburg. The award of the 350 tons for a clubhouse for the Twentieth Century Club of this city is still pending. We quote present shape prices as follows:

Beams and channels, 15-inch and under, 1.50c to 1.60c; over 15 inches, 1.60c to 1.70c; zees, 1.50c to 1.60c; tees, 1.50c to 1.60c; angles, from 3 to 6 inches, 1.50c to 1.60c; over 6 inches, 1.60c to 1.70c; universal and sheared plates, 6¼ inches wide and wider, 1.50c to 1.60c.

**Merchant Pipe.**—Large local gas interests are figuring upon 100 miles of 16-inch line pipe and 180 miles of 6 and 8-inch pipe for shipment to Arkansas. This is one of the largest projects of the year to receive the attention of pipe makers. There is also an inquiry in the market for six miles of 6-inch pipe for a new gas line in Ohio. Some of the principal makers of line pipe have their capacity so engaged that they will be unable to quote on the large line mentioned. The merchant pipe situation shows no change. The jobbers have bought freely for shipments within 30 days and specifications are coming in steadily. The market continues to anticipate an advance soon in steel merchant pipe, but there have been no announcements to this effect. We quote the following official discounts on merchant pipe subject to an additional one point and five off to jobbers:

| | —Steel— | | —Iron— | |
|---|---|---|---|---|
| | Black. | Galv. | Black. | Galv. |
| ⅛ and ¼ inch .... | 71 | 53 | 65 | .. |
| ⅜ inch ..... | 72 | 58 | 66 | 52 |
| ½ inch ..... | 75 | 63 | 69 | 57 |
| ¾ to 6 inch ..... | 79 | 69 | 73 | 63 |
| 7 to 12 inch ..... | 74 | 59 | 68 | 51 |
| PLUGGED AND REAMED. | | | | |
| 1 to 4 inch ..... | 77 | 67 | 71 | 61 |
| EXTRA STRONG PLAIN ENDS. | | | | |
| ⅛ to ⅜ inch..... | 64 | 52 | 59 | 47 |
| ½ to 4 inch..... | 71 | 59 | 56 | 54 |
| 4½ to 8 inch..... | 67 | 55 | 62 | 50 |
| DOUBLE EXTRA STRONG PLAIN ENDS. | | | | |
| ⅛ to 8 inch..... | 60 | 49 | 53 | 44 |

**Boiler Tubes.**—With some makers, the boiler tube trade is now the most active of any line of tubular goods. The buying of locomotive tubes has been especially promising, but the merchant demand has also worked up to lively proportions. Tube prices are firmer than is usually the case in this market. We quote the following official discounts on lap-welded steel boiler tubes to jobbers in carloads:

| | |
|---|---|
| 1 to 1½ inch..... | 49 |
| 1¾ to 2¼ inch..... | 61 |
| 2½ inch ..... | 63 |
| 2¾ to 5 inch ..... | 69 |
| 6 to 13 inch ..... | 60 |

2½ inch and smaller, over 18 feet, 10 per cent net extra.

2¾ inch and larger, over 22 feet, 10 per cent net extra.

To destinations east of the Mississippi river will be sold at delivered discount for carloads lowered by two points, for lengths 22 feet and under; longer lengths, f. o. b. Pittsburg.

We quote the following official discounts on charcoal iron tubes to jobbers:

| | |
|---|---|
| 1 to 1½ inch ..... | 43 |
| 1¾ to 2¼ inch..... | 43 |
| 2½ inch ..... | 48 |
| 2¾ to 5 inch..... | 55 |
| 6 to 13 inch..... | 43 |

**Wire Products.**—The condition of the market in wire products continues to lead to the anticipation of further advances in prices. Makers are more conservative in booking business, and it is reported that one independent interest has withdrawn its present prices, but it is not clear that it has made a general advance. Quotations of 1.85c on nails or $1 advance have been made by this interest within the week, but the circumstances were not conclusive that this is a fixed minimum. Considerable selling of common wire products to the manufacturing trade for first quarter and first half at 1.70c or $2 advance continues. The specifying by the manufacturing trade is very liberal. We quote the prices on wire products for this year's shipment as follows:

Wire nails, jobbers' carload lots, $1.80; retailers' carload lots, $1.85; painted barb wire, jobbers' carload lots, $1.80; retailers' carload lots, $1.85, with 30c for galvanizing; plain wire to jobbers in carloads, $1.60, and to dealers in carloads, $1.65; polished staples, $1.80; galvanized staples, $2.10.

**Wire Rods.**—No developments of note are reported in wire rods. Considerable inquiry is out for next year, but makers are cautious in fixing prices. We quote nominally Bessemer and open-hearth rods at $33 and $34, Pittsburg.

**Coke.**—The consumers of furnace coke who have not covered for their first half needs are holding back from closing contracts at present prices, although some of them have been conducting negotiations with sellers for several weeks. A number of principal furnace interests have yet to cover for the first half, and it is conservatively estimated that from 100,000 to 150,000 tons a month are yet to be bought for shipment up to July 1. The attitude of these buyers, which evidently is due to the belief that they can close as cheaply for their coke a month hence, is keeping the

market rather quiet, and no recent contracts of importance have been made. A steel company in the market this week bought some tonnage for prompt shipment at $2.90, ovens. A fair volume of foundry coke business is moving, and there are more frequent instances of the maximum price of $3.50, ovens, being paid. Foundry consumers are quick in urging shipments where any delay has occurred, showing their active consumption. The supply of box and rack cars is fairly adequate, although some irregularity is to be noted in the former, which are free one day and rather scarce the next. We quote spot furnace coke at from $2.80 to $2.90, ovens, and on contract from $2.85 to $3, ovens. On first class Connellsville foundry coke we quote from $3.15 to $3.25, ovens, for prompt and from $3.25 to $3.50, ovens, on contract. The *Courier's* figures for the week ending Nov. 6 show 34,742 ovens active, with an output of 456,055 tons, compared with 34,706 active ovens and a production of 450,768 tons the previous week.

**Old Material.**—Large consumers of heavy steel in this district, either through their needs being covered or through their buying direct from the producers, are staying out of the open market in old material, and the situation from a dealer's standpoint remains quiet. It is understood some of the largest users in the Pittsburg territory were factors in bidding direct on recent railroads lists. Despite the market's quietness and occasional display of weakness, the undertone is strong. On heavy steel $18, delivered, is representative of the market on tonnages, with higher prices sometimes paid for smaller lots. Turnings and borings continue weak and dealers are having some difficulty to dispose of this material except at reduced prices. Old car wheels are being liberally offered and quotations are lower as there is little buying. A freer movement of stocks of old material from dealers' yards is to be noted. We quote gross tons delivered in the Pittsburg district, including Monessen, Sharon, Brackenridge, Steubenville and Follansbee, as follows:

| | |
|---|---|
| Heavy melting scrap | $17.75 to 18.25 |
| Rerolling rails | 18.50 to 19.00 |
| Bundled sheet scrap | 16.00 to 16.50 |
| Iron axles | 27.00 to 28.00 |
| Old iron rails | 20.00 to 21.00 |
| No. 1 wrought scrap | 19.25 to 19.50 |
| Old car wheels | 18.00 to 18.50 |
| Low phosphorus | 22.00 to 22.50 |
| Machine shop turnings | 13.00 to 13.25 |
| Cast borings | 10.75 to 11.25 |
| No. 1 cast scrap | 17.00 to 17.50 |
| Malleable | 16.50 to 17.00 |
| Stove plate | 13.50 to 14.00 |

The date now set for the sale of the Passaic Steel Co., Paterson, N. J., is Nov. 26. The upset price is $130,000.

## CHICAGO.

### Orders for Finished Products Heavy —Pig Iron is Quiet.

Office of THE IRON TRADE REVIEW,
1328 Monadnock Block, Nov. 16.

All lines of the iron and steel market are busily engaged in getting out the tonnage which has accumulated on the order books, but new business comes in in excess of production, so that in almost every branch of the finished material market, mills are falling further and further behind in their orders. The rate of output is ahead of all records in many instances, but this does not result in catching up with the stream of orders and specifications which is pouring in. The past week has been a quiet one in pig iron circles, but in other lines there has been a very fair average of business. The coke business is very active, and prices are strongly held, with an advancing tendency. Connellsville foundry coke is quoted at $3.35, ovens, for immediate shipment, and may go higher. Locally, there is much interest centered in the effort to force the steam roads entering the city to eliminate the smoke nuisance, and it is known that one of the roads, having the largest suburban service in the city, is experimenting with the various makes of coke, and this has led to renewed interest in the possibility of coking Illinois coal. Some further experimenting has been done in this line, of late, and the outcome of the tests of this coke is awaited with much interest. There has been some talk of the establishment of a Koppers by-product coke plant in the southern part of this state, to use West Virginia coal, but up to the present time nothing definite has been done.

**Pig Iron.**—This been been a very quiet week in the pig iron market in Chicago. Sales have not been many, and have been of a small-lot character, with one or two exceptions. A sale of 4,000 tons of Virginia basic iron for delivery to the East St. Louis and Granite City works of the American Steel Foundries is one of the largest transactions of the week under review. The price is said to have been around $19.50, Chicago. The inquiry for 5,000 tons of basic, for a Chicago steel melting interest, was closed during the week, but only about one-half the requirement was filled. While nothing definite in regard to the price was divulged, it is believed to have been in the neighborhood of $19.25 to $19.40, buyer's works. Shipments from the furnace banks are considerably ahead of production, and stocks are steadily disappearing. A furnace interest in this territory, which, 60 days ago, had upwards of 20,000 tons on hand, will have not over 5,000 tons on hand by the end of this month, and this in spite of the largest production from two stacks in their history. The historic Jefferson furnace, at Oak Hill, Jackson county, Ohio, is preparing to go into blast, it is reported, and a supply of wood and ore is being accumulated. The furnace will make cold-blast charcoal iron. It has been idle for a year. A description of this historic furnace was published in THE IRON TRADE REVIEW, for August, 1909. Jobbing foundries, both gray iron and malleable, are running to full labor capacity, and would be doing more, if more men were available. The fact that shipments of pig iron furnaces are so heavy is an indication that the melting interests are using up their supplies of metal at a rapid rate and in a short time will be compelled to come into the market for whatever requirements are unprovided for.

| | |
|---|---|
| Lake Superior charcoal | $20.00 to 20.50 |
| Northern foundry No. 2 | 19.00 to 19.50 |
| Southern foundry No. 2 | 19.35 |
| Southern silveries, 5 per cent silicon | 19.90 to 20.40 |
| Jackson Co. silveries, 8 per cent. | 21.40 |
| Malleable Bessemer | 19.50 to 20.00 |
| Alabama basic | 19.35 to 19.85 |

**Billets.**—Outside of the large tonnage of billets which is sold under contract in this territory, and the still larger tonnage which is consumed in the works of the makers or some allied industry, there is no market for this class of steel product in Chicago, at present. Eastern mills, for the most part, have to be depended upon for the supply requirements which are not covered by some running agreement, and the price depends largely upon what the user is willing to pay. This condition has continued for so many weeks, that it has become stereotyped.

**Merchant Bars.**—The bar market presents perhaps the strongest front in the iron and steel business, at the present time. Not that there is any appearance of weakness in any of the other lines, but there is seemingly a greater degree of activity in the buying and specifying of bars than of some of the other lines, although in most instances, orders and specifications are running ahead of mill capacity, or at least ahead of present output, which is practically the same thing, except where difficulty is experienced in obtaining labor. Car orders are quite numerous,

and the consequent buying of bars is very heavy. Among present inquiries for cars, the New York Central is understood to be in the market for 27,000, and the Pennsylvania for 10,000. The Delaware, Lackawanna & Western has ordered 1,000 cars from the American Car & Foundry Co., and the Chicago & Northwestern has increased its order with the same company from 500 ore cars to 1,000. The Northern Pacific has ordered 500 50-ton coal cars from the Pressed Steel Car Co. There is a large business coming in to the bar mills in small lots, and prices are very firm, and on some specialties, higher. In common iron bars, the trend of prices is away from the minimum figures, and with some makers, the bulk of business during the past week was taken at around 1.60c, Chicago. Soft steel bar prices are higher. The Bay View works of the Illinois Steel Co., at Milwaukee, broke all its previous records for bar production by rolling a total of 29,540 tons.

We quote for Chicago delivery as follows, with prevailing extras:

Bar iron, 1.55c to 1.65c; hard steel bars, re-rolled, 1.55c to 1.60c; soft steel bars and bands, and light sections, 1.68c to 1.78c; soft steel angles, less than 3 x 3, 1.68c to 1.78c; hoops, 1.68c to 1.78c; planished or smooth finished tire steel, 1.88c to 1.93c; iron finish, up to 1½ x ½-inch, 1.83c, base, tire card; iron finish, 1½ x ½-inch and larger, 1.68c, base, bar card; channel for solid rubber tires, ¾ to 1 inch, 2.18c, flat; and 1⅛ inch and larger, 2.08c, flat; smooth finished machinery steel 1 inch and larger, 2.43c; flat sleigh shoe, 1,73c; toe calk steel, 2.23c; spring steel, 2.28c; crucible spring steel, 2.78c; tool steel, 7c to 9c, with higher prices for special grades. Quotations on shafting are 55 per cent off the list for carload lots, and 50 per cent off for less than carload lots, carload freight allowed to points in base territory.

On iron and steel bars from local stocks, we quote, as follows: Bar iron, 2.00c to 2.10c, base; soft steel bars, 1.90c to 2.00c per 100 pounds base; soft steel hoops, 2.40c to 2.50c, full extras.

**Cast Iron Pipe.**—This line is rather quiet, being affected by the approach of cold weather, when pipe-laying will be suspended entirely, or limited to a very small amount of work that is absolutely necessary. Next year's projects are being shaped up, and in a very few weeks will take the form of proposals upon which pipe-casting works will be asked to make tenders. At Kansas City, Kans., the Dimmick Pipe Co., of Birmingham, Ala., was found to be the lowest bidder on the 1,000 tons of pipe for which that town recently came into the market. St. Paul, Minn., will have a letting on 2,500 tons on Nov. 22.

We quote as follows: 4-inch water pipe, $28.50; 6 to 16 inches, $27.50; larger sizes, $26.50; gas pipe, $1 a ton higher.

**Plates.**—There is a heavy tonnage appearing on the order books of manufacturers, but the latter are pursuing a very conservative policy in regard to scrutinizing specifications and rejecting anything which seems like speculation. Legitimate wants are pretty well known, and when an unusually heavy order or specification is received, it causes some investigation. Also, if a definite tonnage per month is named, and only a part of it is specified for, the balance for that month is cancelled, and not allowed to accumulate for delivery in the later months.

We quote, Chicago delivery, as follows: Tank plates, ¼-inch thick, 6¼ to 100 inches, 1.78c to 1.88c. For extras see Pittsburg report.

Store quotations are without change, as follows: Tank steel, ¼-inch and heavier up to 72 inches wide, 2.00c to 2.10c; from 72 inches wide to 96 inches wide, 2.10c to 2.20c; 3/16-inch up to and including 60 inches wide, 2.10c to 2.20c; 72 inches, 2.35c to 2.45c; No. 8 up to 60 inches wide, 2.15c to 2.25c. Flange and head quality, 25c extra.

**Sheets.**—Following the action of the American Sheet & Tin Plate Co., in advancing prices on blue annealed and galvanized sheets, on Nov. 11, the other manufacturers have advanced their figures in conformity with the leading interest. Store prices also are higher, the advance affecting the lighter gages of blue annealed, and all the gages of galvanized. The former were put up 15 cents per hundred pounds, and the latter, 20 cents.

For mill prices see Pittsburg report, freight to Chicago, 18 cents.

We quote store prices at Chicago as follows: No. 10, 2.25c to 2.35c; No. 12, 2.30c to 2.40c; No. 14, 2.35c to 2.45c; No. 16, 2.45c to 2.55c; Nos. 18-20, 2.80c to 2.90c; Nos. 22-24, 2.85c to 2.95c; No. 26, 2.90c to 3.00c; No. 27, 2.95c to 3.05c; No. 28, 3.05c to 3.15c; No. 30, 3.30c; galvanized sheets, Nos. 10 and 16, 3.20c to 3.30c; Nos. 18 and 20, 3.35c to 3.45c; Nos. 22 to 24, 3.50c to 3.60c; No. 26, 3.50c to 3.80c; No. 27, 3.90c to 4.00c; No. 28, 4.10c to 4.20c; No. 30, 4.50c to 4.60c.

**Wire Products.**—There is a seasonable business in all lines of wire manufacture and prices are maintained firmly at previous quotations.

We quote, Chicago delivery, for the remainder of this year, as follows:

Wire nails, jobbers' carload lots, $1.98; retailers' carload lots, $2.03; retailers' less than carload lots, $2.13; painted barb wire, jobbers' carload lots, $1.98; retailers' carload lots, $2.03; retailers' less than carload lots, $2.13; with 30c for galvanizing; plain wire to jobbers, carload lots, $1.78; staples, bright, $1.98.

**Merchant Pipe.** — Considering the season of the year, when projects involving the digging up of the ground must necessarily be deferred until spring, or carried on under a heavy handicap as soon as winter sets in, the amount of trade being done in merchant pipe is very satisfactory. In boiler tubes, the volume of business represents a very fair average. No change in discounts has been made, in either mill or store prices.

For mill discounts, see Pittsburg report.

We quote, out of store, as follows: Wrought steel pipe, black, ⅛-inch to ¼-inch, 68 per cent; ⅜-inch, 69 per cent; ½-inch, 72 per cent; ¾-inch to 6-inch, 76 per cent; 7-inch to 12-inch, 71 per cent. Iron pipe about 6 points higher.

Lap-welded steel tubes, 2¼-inch to 5-inch, 60 to 62 per cent; charcoal iron tubes, 2¼-inch to 4-inch, 48 to 50 per cent; seamless steel tubes, 2¼-inch to 4-inch, 47½ per cent.

**Structural Material.** — While there has been no very heavy buying or specifying in the past week, there is a very respectable tonnage coming in all the time, and a number of large projects loom up ahead, which will be closed about Jan. 1. The bids for the big bridge at St. Louis, mentioned recently in these reports, are to be opened to-day. The American Bridge Co. has secured the contract for 360 tons of steel to be used in connection with the new Koppers by-product coke ovens at Gary.

We quote mill prices for structural shapes, Chicago delivery, as follows:

Beams and channels, 15-inch and under, 1.78c to 1.88c. For extras see Pittsburg report.

Local store prices are as follows: All angles, 3 inches and larger, including 6 inches, $2.00 to $2.10 per 100 pounds; angles over 6 inches, $2.10 to $2.20 per 100 pounds base; beams 3 to 15 inches, inclusive, $2.00 per 100 pounds base; channels, 3

inches and larger, $2.00 per 100 pounds, base.

**Rails and Track Supplies.** — The amount of heavy steel rails sold by the leading interest during the past week was very small—only 2,500 tons, but the total sales for the present year have been very heavy. Track fastenings are being ordered in heavy quantities, and light section rails are in good demand.

See Pittsburg report for prices on standard sections.

On light rails, Chicago delivery, we quote as follows: Light rails, 40 and 45-pound, $26.00; 30 and 35-pound, $26.75; 16, 20 and 25-pound, $27; 12-pound, $28. In lots of 250 to 500 tons a reduction of 60c a ton from these prices is made; lots of 500 tons and up carry a reduction of $1 a ton. Track supplies, f. o. b. Joliet, angle bars, 1.50c to 1.60c; railroad spikes, 1.80c to 1.90c; smaller size spikes, 1.85c to 1.90c, base; track bolts with square nuts, 2.30c to 2.55c, base; with hexagon nuts, 2.45c to 2.70c.

**Old Material.**—Another week of quiet is to be recorded in this market, and one in which scarcely anything has been done. The result has been to make a still further softening in sentiment in the market, which would be reflected in prices if there were sufficient business going to establish quotations. All that can be said is, that the market is at a stand-still, and that any effort to sell would result in a general reduction of quotations. In consequence of this situation, dealers are not trying to create business, but are waiting until some of the stocks in the hands of consumers are used up, when a new buying movement may be looked for.

We quote, gross tons, as follows:

| | |
|---|---|
| Old car wheels | $18.00 to 18.50 |
| Old iron rails | 20.50 to 21.50 |
| Rerolling rails (4 ft. and over) | 17.75 to 18.25 |
| Old steel rails (2 ft. and under) | 17.25 to 17.75 |
| Light section relayers, 45 lbs. and under subject to inspection | 21.00 to 23.00 |
| Relaying rails, subject to inspection | 24.50 to 25.00 |
| Frogs, switches and guards | 15.75 to 16.25 |
| Heavy melting steel | 15.50 to 16.00 |
| Shoveling steel | 15.00 to 15.50 |

We quote, net tons, as follows:

| | |
|---|---|
| No. 1 R. R. wrought | $15.00 to 15.50 |
| No. 2 R. R. wrought | 14.00 to 14.50 |
| Arch bars and transoms | 18.50 to 19.00 |
| Knuckles, couplers and springs | 15.00 to 15.50 |
| Shafting | 17.50 to 18.00 |
| Iron car axles | 21.50 to 22.00 |
| Steel car axles | 20.50 to 21.00 |
| Locomotive tires | 18.00 to 18.50 |
| Dealers' forge | 13.00 to13.50 |
| Pipes and flues | 12.00 to 12.50 |
| No. 1 cast, 150 lbs. and less | 14.75 to 15.25 |
| No. 1 bbusheling | 13.00 to 13.50 |
| No. 2 busheling | 10.00 to 10.50 |
| No. 1 boiler cut | 11.50 to 12.00 |
| Boiler punchings | 15.00 to 15.50 |
| Cast and mixed borings | 7.25 to 7.75 |
| Machine shop turnings | 10.75 to 11.25 |
| Railroad malleable | 14.75 to 15.25 |
| Agricultural malleable | 13.00 to 13.50 |
| Stove plate and light cast scrap | 12 75 to 13.25 |
| Angle bars, splices, etc. (iron) | 17.75 to 18.25 |
| Angle bars, steel | 15.50 to 16.00 |

## CLEVELAND.

### Lake Shore Finds Some Difficulty in Making Contracts.

Office of THE IRON TRADE REVIEW, Browning Building, Nov. 16.

**Iron Ore.**—Representatives of iron ore interests opposed to early action in regard to prices are still adhering to their position, and no one seems to be anxious to hurry the opening of the ore market. The movement from the mines is heavy, in spite of the low water and delays caused by the accident at the Poe lock. Shipments for November will probably exceed 5,000,000 tons.

On base ores with the guarantee of 55 per cent on old range and Mesabi Bessemer, and 51½ per cent. on old range and Mesabi non-Bessemer, we quote as follows: Old range Bessemer, $4.50; Mesabi Bessemer, $4.25; old range non-Bessemer, $3.70; Mesabi non-Bessemer, $3.50.

**Pig Iron.**—The market is very quiet, but there is no evidence of weakness. The melt is increasing, and foundries are unable to get enough moulders. It has developed that part of the pig iron recently purchased by the leading Ohio pipe interest was obtained from middlemen at a somewhat lower quotation than furnaces were willing to make. This part of the tonnage was not northern. A valley interest which it is understood is willing to shade prices, has not yet caused much of a stir. We quote for prompt delivery in Cleveland as follows:

| | |
|---|---|
| No. 1 foundry | $ 18.75 |
| No. 2 foundry | 18.25 |
| No. 3 foundry | 17.75 |
| No. 2 southern | 18.85 |
| Gray forge | 17.40 to 17.65 |
| Bessemer | 19.90 |
| Lake Superior charcoal | 19.50 to 20.00 |
| Jackson Co. 8 per cent silvery | 20.55 |

**Coke.**—Some foundries are finding that they will need more coke than they have contracted for, and the demand for prompt delivery is excellent. On foundry coke we quote for first half delivery, $3.25 to $3.50, and on prompt delivery, $3.15 to $3.25. We quote Connellsville furnace coke $2.80 to $2.90 for prompt and $2.85 to $3.00 for first half.

**Finished Material.**—The principal development in new business was buying by the railroads. The Lake Shore has had trouble in making requirement contracts in accordance with its custom, as mills are showing a firm disposition not to make a contract except for definite tonnagees and these for no longer a time than July 1. The company succeeded in making a contract for a large tonnage of bar iron but the mill exacted that definite tonnage be named. Contracts for other materials have not yet been awarded. It is understood that the company's recent experience was a distinct disappointment, as it had hoped to contract at least up to July 1, and possibly for the entire year. The B. & O. railroad has also been a buyer of bar iron, and the market for that product is in a more satisfactory condition, although still showing some irregularity. There is a constantly increasing demand for prompt delivery of plates and consumers freely pay premiums of several dollars a ton to get material in time desired. Eastern makers of plates and shapes find it possible to sell in Ohio territory on account of the slow delivery of mills located in that territory.

**Old Material.**—The idea seems to be prevalent among local dealers that the inactivity of the scrap market will not last much over a week longer. Of course, it is not expected that the conditions of a month ago will be attained in this time, and it is not probable that even the majority of consumers in this district will be in the market again within two weeks. Nominal quotations, gross tons, f. o. b. Cleveland, are as follows:

| | |
|---|---|
| Old iron rails | $21.00 to 21.50 |
| Old steel rails (under 6 feet) | 17.50 to 18.00 |
| Old car wheels | 18.50 to 19.00 |
| Old steel boiler plate | 14.00 to 14.50 |
| Malleable iron (railroad) | 18.00 to 18.50 |
| Steel axles | 19.50 to 20.00 |
| Malleable iron (agricultural) | 16.00 to 16.50 |
| Heavy steel | 16.25 to 16.75 |
| Country mixed steel | 14.00 to 14.50 |

We quote, net tons, as follows:

| | |
|---|---|
| No. 1 R. R. wrought | $17.00 to 17.50 |
| No. 1 busheling | 14.25 to 14.75 |
| No. 1 machine cast | 15.00 to 15.50 |
| Axle turnings | 11.50 to 12.00 |
| Machine shop turnings | 11.00 to 11.50 |
| Grate bars | 12.50 to 13.00 |
| Pipes and flues | 12.50 to 13.00 |
| Tank iron | 12.00 to 12.50 |
| Sheet iron | 7.00 to 7.50 |
| Wrought drilling | 11.00 to 11.50 |
| Stove plate | 12.50 to 13.00 |
| Cast borings | 9.00 to 9.50 |

## CINCINNATI.

### Inquiry Light and Some Sales Made Below Usual Quotations.

Office of THE IRON TRADE REVIEW, First National Bank Bldg., Nov. 16.

**Pig Iron.**—Inquiry continues light and the market is quiet. A few small sales are being made from day to day with an occasional round lot order. During the week, an Ohio melter has bought 1,200 tons of malleable for first half delivery at prices ranging from $17.20 to $17.50 Ironton, although some of the tonnage was not placed in the Ironton district. A sale of 1,000 tons of Virginia iron for first quarter delivery was made to an Ohio melter at $16.00 Virginia furnace for No. 2 foundry. There is an inquiry from a large

local manufacturing concern for prices on 150 tons per month, beginning Jan. 1 for foundry iron. The general market is regarded as easy. It appears that efforts to place a liberal tonnage of southern iron at $15.00 Birmingham for next year's delivery have failed to result in heavy purchases. Holders of speculative iron are desirous of realizing on their holdings and this resale iron has a tendency to depress the market. Furnaces which have sold to speculators are now calling upon the holders of the iron to furnish shipping instructions and this applies to northern furnaces as well as southern. The resulting efforts to sell iron naturally has a tendency to disturb the furnace level of quotations. There is a liberal supply of southern iron available at $14.50 Birmingham for delivery over the remainder of the year for which there appears to be a limited demand. It is also generally believed that melters with a few exceptions have covered their first quarter requirements and the probability of the spot market continuing below the forward delivery quotations after the first of the year is freely discussed. The new furnaces blown in in the southern territory with iron to sell for the first quarter make it appear that supplies of southern iron are likely to continue liberal. The northern furnace situation is somewhat stronger than the southern, as the northern furnaces have sold a liberal tonnage through the first half and there appears to be but little spot northern iron pressing the market. The blowing in, however, of the stack at Hamilton, Ohio, in the near future will, it is believed, have a tendency to relieve any pressure for prompt shipment northern iron. These features of bearish influence are offset, however, by evidences of increasing consumption and the occasional appearance of a melter in the market for pig iron who was thought to have covered his requirements and in such instances it is notable that the purchasers of this additional tonnage are large melters. It is also generally believed that cast iron pipe manufacturers including the leading interest are uncovered for the first quarter of next year. Several other large consumers of southern iron will also undoubtedly need a considerable tonnage. This view of the situation makes it appear that while there is considerable tonnage yet to be bought for the first quarter, there is also a liberal available supply in sight. The present lull may reasonably be regarded as only natural after the heavy buying during which time buyers were covering their requirements for the remainder of this year and the first quarter and first half of 1910. Northern iron for prompt shipment and for delivery over the remainder of the year is quotable at $17.00 and for first half of next year at $17.50 Ironton. Southern iron for prompt delivery and for the remainder of the year is quotable at $14.50 Birmingham and for first half of 1910 at $15.00 Birmingham. These are the recognized market prices and are generally maintained by the furnaces, but resale iron sold slightly below established figures. We quote for prompt delivery and for delivery over the remainder of the year, delivered Cincinnati, based on freight rates of $3.25 from Birmingham and $1.20 from Ironton as follows:

| | |
|---|---|
| Southern foundry No. 1 | $18.25 to 18.75 |
| Southern foundry No. 2 | 17.75 to 18.25 |
| Southern foundry No. 3 | 17.25 to 17.75 |
| Southern foundry No. 4 | 16.75 to 17.25 |
| Southern No. 1 soft | 18.25 to 18.75 |
| Southern No. 2 soft | 17.75 to 18.25 |
| Southern gray forge | 16.75 to 17.00 |
| Northern No. 1 foundry | 18.70 to 19.20 |
| Northern No. 2 foundry | 18.20 to 18.70 |
| Northern No. 3 foundry | 17.70 to 18.20 |
| Jackson county 6 per cent silicon | 19.20 |
| Jackson county 8 per cent silicon | 20.20 |
| Jackson county 10 per cent silicon | 21.20 |

**Finished Material.**—There is no material change in the situation. There is the continued urgent call for deliveries and a good demand from stock as consumers are forced to buy small lots to keep going waiting on mill shipments. Prices are strong for all descriptions. Sales are mainly based on Pittsburg prices.

**Coke.**—There is a good movement of coke on contracts and a steady call for prompt shipment coke. Ovens are able to keep consumers going, but there is no surplus of spot coke and ovens are holding up prices for the little free coke they have to sell. There is not much figuring being done on contracts for next year as yet, but some foundries are still uncovered for the first half of 1910, and will be likely to come into the market before long. Prices in the leading coke-producing districts are as follows:

| | Prompt shipment. | Remainder of year. | First half 1910. |
|---|---|---|---|
| **Connellsville district:** | | | |
| Fdy. coke. | $3.25 to 3.40 | $3.25 to 3.40 | $3.25 to 3.50 |
| Fur. coke. | 2.85 to 3.00 | 2.85 to 3.00 | 2.90 to 3.10 |
| **Wise county district:** | | | |
| Fdy. coke. | 2.75 to 3.00 | 2.75 to 3.00 | 3.00 to 3.50 |
| Fur. coke. | 2.25 to 2.50 | 2.75 to 3.00 | *Sliding [scale basis. |
| **Pocahontas district:** | | | |
| Fdy. coke. | 3.00 | 3.00 | 2.75 to 3.00 |
| Fur. coke. | 2.75 | 2.75 | 2.50 to 2.75 |

*Sliding scale basis means $1.60 for coke based on $9, Birmingham, for pig iron, with an advance of 16⅔ per cent of the amount over $9 at which pig iron is quoted. This is the usual basis. Other forms of sliding contracts are also made.

**Old Material.**—The market is easy and dull. Consumers are not accepting shipments freely on contracts and some of the usual channels have for the present stopped shipments. Cast scrap is weaker and slightly lower. Quotations are dealers' asking prices covering cost of preparation and dealers' profit:

| | |
|---|---|
| Old No. 1 R. R. wrought, net tons | $13.50 to 14.00 |
| No. 1 machinery, net tons | 13.50 to 14.00 |
| No. 1 busheling, net tons | 14.00 to 14.50 |
| Old iron rails, gross tons | 18.50 to 19.00 |
| Old steel rails (re-rolling) gross tons | 17.50 to 18.00 |
| Old short lengths, gross tons | 16.00 to 17.00 |
| Old iron axles, net tons | 19.00 to 19.50 |
| Heavy melting scrap, gross tons | 15.00 to 15.50 |
| Stove plate, net tons | 10.50 to 11.00 |
| Heavy turnings, net | 9.25 to 9.75 |
| Cast borings, net tons | 8.25 to 8.75 |
| Car wheels | 15.50 to 16.00 |

The Lunkenheimer Co., Cincinnati, is expecting to have its new iron foundry in operation by Jan. 1, and is in the market for pig iron for delivery in the first half of 1910.

Matthew-Addy & Co. of Cincinnati, have been appointed exclusive agents for the sale of the iron of the La-Follette furnace at LaFollette, Tenn., which is expected to go into blast about Jan. 1. F. P. Howe is the president of the new company and a large tract of ore land has been purchased near Cartersville, Ga. The product of the furnace will be made from a mixture of 1/3 local LaFollette red ore and 2/3 of the Georgia brown ore.

## BUFFALO.

### Decrease in Inquiries For Pig Iron—Basic is Strongest.

Office of THE IRON TRADE REVIEW,
932 Ellicott Square, Nov. 16.

**Pig Iron.**—The general tone of the pig iron market is much easier than that of a week ago. A falling off in inquiries is observed, but not sufficient to cause a change in quotations for first quarter's deliveries. Prices given below are identical wtth those named last week with the exception of basic which has advanced, and fairly represent the Buffalo market. No particular significance is attached to the weak points of this week's market, as slight depressions of this character have occurred several times since the market regained its balance after the long period of depression.

Basic iron develops the strongest demand and cannot be bought at this point, the producers being covered for the remainder of the year. To name a price representing the market would be to give $18 minimum, and $18.50. f. o. b. Buffalo. Consumers appear anxious to get early deliveries of basic, but recent orders booked

cover the entire output of the furnaces for the year and quoting has therefore been cut out.

We quote f. o. b. Buffalo for deliveries during this year as follows:

| | |
|---|---|
| No. 1X foundry | $17.25 to 17.75 |
| No. 2X foundry | 16.75 to 17.25 |
| No. 2 plain | 16.75 to 17.00 |
| No. 3 foundry | 16.25 to 16.50 |
| Gray forge | 16.00 to 16.50 |
| Malleable Bessemer | 17.25 to 18.25 |
| Basic | 18.00 to 18.50 |
| Charcoal | 20.00 to 21.00 |

**Finished Products.**—The tone of the bar and structural market at this point is generally conceded to be much quieter than it has for some weeks past. November appears to show a falling off in the number of inquiries. The nature of the inquiries now being received here shows a decided interest in structural and this interest comes from manufacturers who are evidently contemplating extensions of their factory facilities. Fabricators get some comfort from this phase of the situation and will probably enjoy good business in 1910, when the factory extension proposition gets well under way. There are a dozen large interests in this territory now having plans prepared for increasing their manufacturing facilities and it is expected that within two weeks or a month specifications will be out on some of this business and bids will be asked for. Locally, this interest shown by manufacturers is taken to indicate a strong condition of business. Those seeking information from the steel interests seem considerably more interested in the prospects for tonnage deliveries than in the prices which are named.

**Old Material.**—There has been no material change noted in the scrap market and prices are held as before. There is only a light demand for tonnage and those holding heavy stocks seem inclined to retain the same in hopes of stronger market conditions later on. We quote, gross tons, f. o. b. Buffalo as follows:

| | |
|---|---|
| Heavy melting steel | $16.50 to 17.00 |
| No. 1 railroad wrought scrap | 18.25 to 18.75 |
| No. 1 railroad and machine cast scrap | 16.50 to 17.00 |
| Old steel axles | 21.00 to 21.50 |
| Iron axles | 26.00 to 26.50 |
| Car wheels | 19.00 to 19.50 |
| Railroad malleable scrap | 17.00 to 17.50 |
| Machine shop turnings | 12.00 to 12.50 |
| Cast iron borings | 9.50 to 10.00 |
| Low phosphorus steel scrap | 21.00 to 22.00 |
| Old iron rails | 20.00 to 21.00 |
| Tank iron | 14.00 to 14.50 |
| Sheet iron | 9.00 to 9.50 |
| Stove plate | 14.00 to 14.50 |
| Pipe and flues | 14.00 to 14.50 |
| Grate bars | 13.00 to 13.50 |
| Boiler plate | 15.50 to 16.00 |

Four out of the six plants affected by a molders' strike at Canton, O., have agreed to the men's demands for shorter hours and more pay, the men returning to work.

## NEW YORK.

### Sales of Spanish Ore—Pig Iron Market Shows Little Activity.

Office of THE IRON TRADE REVIEW, Room 1005, No. 90 West St., Nov. 16.

**Iron Ore.**—A total of about 50,000 tons of Spanish ore has been sold by one interest since our last report and important lots are being offered by two or three selling houses which have only recently engaged in this movement. Ocean freights continue at about 9 shillings from Spanish ports to Philadelphia, but the large number of vessels pressed into this service is causing increasing difficulty in securing return cargoes, and a further advance may develop. So much outward-bound vessel capacity is now offering that the cotton rate has decreased over 2 shillings in the last two or three weeks. Advices from Spain are that the Bilbao mine ores are declining to quote for 1910 delivery and that substantially higher prices may prevail.

**Pig Iron.**—The eastern market is extremely quiet, showing less activity than at any time since the beginning of the fall buying movement. There is a fair buying of foundry iron in small lots, with occasionally a block of 1,000 tons, and requests for anticipated delivery are more numerous, but with this exception the market is featureless. There are rumors of slight concessions on Buffalo iron for prompt shipment, as well as on eastern basic, the latter growing out of the large block recently closed at $18.50 to $18.60, delivered. Producers of basic iron in both Virginia and eastern Pennsylvania, however, insist that $19 is still the prevailing price, and that this figure will be secured on a large tonnage which will have to be closed within the early future. The Virginia Iron, Coal & Coke Co. has put in one of its Crozier furnaces, giving it three stacks in blast. The Empire Steel & Iron Co. will blow in its Macungie furnace as soon as necessary repairs are made. Little is heard of British iron in this market, although part cargoes are arriving from time to time. We quote, delivery at New York tidewater over the remainder of the year and first quarter, as follows:

| | |
|---|---|
| Northern foundry No. 1 | $19.50 to 20.25 |
| No. 2X foundry | 19.00 to 19.75 |
| No. 2 plain | 18.50 to 19.25 |
| No. 2 southern foundry | 19.50 to 20.00 |
| Malleable | 19.00 to 19.50 |
| Gray forge | 17.75 to 18.25 |

**Ferro-Alloys.**—The market is decidedly more quiet with a few scattering sales of prompt ferro-manganese at $45, seaboard, and inquiries current for about 1,500 tons, chiefly for eastern delivery. A small inquiry for ferro-silicon is noted, the market ruling at about $63, Pittsburg.

**Cast Iron Pipe.**—Interest centers in the letting on Wednesday of 15,000 tons of 48-inch pipe for Brooklyn, for which alternate bids on riveted steel pipe are also being taken. On Saturday a gas company in New England will open bids on 2,400 tons of small pipe, and on Nov. 23 Providence has a letting on 675 tons. A local contractor has placed orders with the Warren Foundry & Machine Co. for 1,400 tons, and fairly heavy buying for 1910 delivery is noted on the part of New England consumers. Prices continue ragged, as one or two interests as yet have not come up to the level assumed by the majority of foundries.

**Finished Materials.**—The largest structural project before the trade is the St. Louis bridge, 16,000 tons, on which bids went in today. Nothing has developed in connection with the Whitehall building extension and the Brooklyn subway contractors have not yet troubled themselves about their steel requirements. Among contracts recently closed were the following: Fargo Trust building, in Boston, 3,000 tons, American Bridge Co.; Thirty-first street pier, New York city, 1,500 tons, Brown-Ketchum Iron Works; extension to the Allis-Chalmers plant, 300 tons, and a saw mill in California, 500 tons, Worden-Allen Co.; St. Francis hospital at San Francisco, 400 tons, Ralston Iron Works. Snare & Triest are low on the Newark highway bridge, 2,000 tons. Prices on structural shapes are firming up, but plate contracts can still be made as low as 1.50c, Pittsburg. Another local project upon which bids have been received is the warehouse at Twenty-ninth street and Eleventh avenue for W. & J. Sloane, requiring 1,200 tons. The changing of considerable rail capacity on to billets has eased the situation in that line and efforts are being made to dispose of good quantities of British billets and sheet bars in this market, but no selling of importance is noted.

Quotations for New York delivery are as follows: Angles, 3 to 6 inches x ¼ inch and heavier, 1.66c to 1.86c; beams, 3 to 15 inches, 1.66c to 1.86c; tees, 3 x ¼ inch and heavier, 1.66c to 1.86c; plates, carload, tank, 1.66c to 1.86c; marine boiler, 2.06c to 2.16c; bar iron, 1.55c to 1.60c; soft steel bars, 1.61c to 1.66c; sheets, No. 28, black, 2.46c.

**Old Materials.**—The market is in a rather inactive state, with both rolling mills and foundries buying sparingly. The former have succeeded in shading down the prices on wrought pipe and

other rolling mill materials by 50c to 75c per ton. Old steel axles are slightly lower. A steady volume of foreign scrap is coming into the country for eastern Pennsylvania mills, and it is understood that negotiations are now pending for about 40,000 tons for the allied buying interests. We quote, gross tons, as follows, these being prices which New York dealers are willing to pay:

| | |
|---|---|
| Old steel rails (re-rolling) | 17.00 to 17.50 |
| Relaying rails | 21.00 to 21.50 |
| Old car wheels | 15.00 to 15.50 |
| Old iron car axles | 22.00 to 23.00 |
| Old steel car axles | 20.00 to 20.50 |
| Heavy melting steel | 15.50 to 16.00 |
| No. 1 railroad wrought | 18.00 to 18.50 |
| Iron track scrap | 16.00 to 16.50 |
| Wrought pipe | 14.00 to 14.50 |
| Cast borings | 10.50 to 11.00 |
| Wrought turnings | 12.50 to 13.00 |
| Heavy cast scrap | 15.00 to 15.50 |
| Railroad malleable | 14.00 to 14.50 |
| Stove plate | 11.50 to 12.00 |
| Grate bars | 12.00 to 12.50 |

## PHILADELPHIA.

### Sale of Basic at Slight Concession, But No Real Weakness.

Nov. 16.

**Pig Iron.**—The feature of the week has been the development that one of the eastern plate works has taken on at least 25,000 tons additional basic for first half delivery, the order being divided between two furnace interests enjoying low freights, one booking 10,000 tons at $18.50, delivered, and the other 15,000 tons at $18.60, equivalent to about $18.00, furnace, in each instance. This sale was made fully ten days ago and has just come to light. Two other furnace interests were offered good tonnages on this basis by the purchaser, but declined to shade their quotations of $19.00. Sales of eastern Pennsylvania product on that level, however, have been few and of relatively small tonnage, consumers recently having preferred to buy Virginia basic at that figure rather than excite the local market. Bookings are now being sought for the output of the Tidewater furnace, and the past week has disclosed two good blocks of basic available at other plants, one of almost 20,000 tons of standard and "off" iron by the New Jersey interest for early shipment, and the other of 10,000 tons by an eastern Pennsylvania plant for second quarter, the asking price in both instances being a $19.00, delivered, basis. There is no denying the fact, however, that basic iron is relatively scarce and the situation can not be said to have weakened. Considerable low phosphorus inquiry is current and consumers are not inclined to haggle over prices now asked for delivery in this district, $22.50 to $23.50, but some importation of British hematite is likely to develop at any time. Gray forge is firm at $18.00 to $18.25, delivered, with one large block still under negotiation. The sale of 6,000 tons reported last week at $17.75, delivered, was made by a furnace having switching connections with the purchaser; hence the price was practically, at furnace. Foundry iron is quiet, with prices firm at $19.00 to $19.50 for No. 2X delivered. We note a 500-ton sale of charcoal iron at full prices. Coke is relatively inactive. We quote, delivery at eastern Pennsylvania plants over the remainder of the year and the first quarter, as follows:

| | |
|---|---|
| No. 1X foundry | $19.50 to 20.00 |
| No. 2X foundry | 19.00 to 19.50 |
| No. 2 plain | 18.50 to 19.00 |
| Standard gray forge | 17.75 to 18.25 |
| Basic | 18.50 to 19.00 |
| Low Phosphorus | 22.50 to 23.50 |
| No. 2 Birmingham | 19.50 to 20.00 |
| No. 2X Virginia | 19.50 to 20.00 |
| No. 2 plain Virginia | 19.00 to 19.50 |

**Finished Materials.**—Heavy contracting of plates for first quarter has featured the local market of late, one interest reporting bookings of about 75,000 tons, averaging well above a 1.50c, Pittsburg, basis, and one lot of 1,500 tons for western shipment going at over 1.60c, Pittsburg. Other plate makers have taken substantial orders and the price for any delivery is hardening around 1.60c, Pittsburg, some mills now turning down business offered at a lower figure, but on attractive tonnages first quarter contracting can still be done at 1.50c, Pittsburg. Billets continue in brisk demand and eastern mills are shipping important tonnages as far west as Ohio; there is no longer an established basing price, but the minimum is now about $30, delivered in this district. The billet mill to be built at Lebanon for operation on electric steel will supply only the requirements of the American Iron & Steel Mfg. Co. Steel bar deliveries show no improvement and mills are urging the placing of orders for material needed in spring concrete reinforcing work. Specifications on all lines are heavy, as consumers understand all unspecified tonnage will be cancelled with expiring contracts. Railroad buying continues brisk with some southern lines in the market.

In the structural field the outlook is favorable. Plans are in builders' hands for a 20-story building at Twentieth and Arch streets; bids have gone in on the Stetson building, 1,500 tons; the McCall school, 425 tons, is still undecided; bids have been taken on the marine barracks at the local navy yard, 500 tons; the million-dollar hotel Emerson project at Baltimore bids fair to go through; and the Pennsylvania Steel Co. will probably secure the Harrisburg school, 450 tons.

We quote: Shapes and plates, 1.65c to 1.85c; steel bars, 1.60c to 1.65c; iron bars, 1.55c to 1.65c; sheets, No. 28, 2.80c.

**Old Materials.**—The associated mills have re-affirmed the $18.00, delivered, price on heavy melting steel. In several cases they are rather short of scrap and are rushing deliveries wherever possible. In this connection it develops that threats of embargoes recently at several consuming points were due not so much to heavy receipts as to the fact that advantage was being taken of the large movement and the brisk demand to slip in inferior material. Rolling mills are offering slightly below the prices quoted, but are securing little. A steady stream of British and Belgian scrap is arriving in small lots and occasional tonnages come from Canada and the South. We quote, gross tons, delivered at eastern Pennsylvania mills, as follows:

| | |
|---|---|
| Old steel rails (rerolling) | $19.25 to 19.75 |
| No. 1 steel scrap | 18.00 to 18.50 |
| Old steel axles | 24.00 to 24.50 |
| Old iron axles | 30.00 to 31.00 |
| Old iron rails | 21.00 to 22.00 |
| Old car wheels | 17.50 to 18.00 |
| Choice scrap R. R. No. 1 wrought. | 20.25 to 20.75 |
| No. 1 yard scrap | 18.50 to 19.00 |
| Machinery scrap | 17.50 to 18.00 |
| Low phosphorus scrap | 23.00 to 23.50 |
| Wrought iron pipe | 17.25 to 17.75 |
| No. 1 forge fire scrap | 16.50 to 17.00 |
| No. 2 forge fire scrap, ordinary. | 9.50 to 10.00 |
| Wrought turnings | 15.00 to 15.50 |
| Axle turnings, heavy | 16.50 to 17.00 |
| Cast borings | 13.00 to 13.50 |
| Stove plate | 14.25 to 14.75 |

## ST. LOUIS.

### Sale of Virginia Basic Pig Iron—Prices Stationary.

Nov. 16.

**Pig Iron.**—One of the largest steel foundries in the St. Louis territory has purchased 4,000 tons of Virginia basic pig. With this exception, the market for pig iron is decidedly quiet, but the price for No. 2 Southern remains firm at $15 for any delivery beyond Jan. 1, with some resale iron to be had at $14.50 for immediate shipment.

The foundries seem to be increasing their melt, and quite a number of orders for single cars and up to 100 tons were placed last week to fill requirements. A shortage of transportation facilities has hampered the shipments, and fancy prices were asked for iron for shipments on tracks.

Southern furnaces are asking $15 for No. 2 for prompt delivery, Birmingham basis, for remainder of the

year and first half shipment. Ohio strong No. 2 is offered at from $17 to $17.50, Ironton. Malleable Bessemer is scarce and $17.25 to $17.75 f. o. b., furnaces reported to have been obtained. Our quotations for southern iron, delivered, to which the freight of $3.75 from Birmingham has been added, follow:

| | | |
|---|---|---|
| No. 1 | southern | $18.75 to 19.25 |
| No. 2 | southern | 18.25 to 18.75 |
| No. 3 | southern | 17.75 to 18.25 |
| No. 4 | southern | 17.25 to 17.75 |

**Coke.**—Quite a number of orders for coke from car loads up to 800 tons were received last week, at prices ranging from $3.25 to $3.50, ovens, It is reported that about half of the inquiry for 5,000 tons monthly delivery, which has been pending for about 10 days, was closed last week, leaving the remainder still unsold. The best 72-hour Connellsville foundry coke is offered at $3.25 to $3.50, ovens, for prompt and future delivery; 48-hour Connellsville furnace at $2.85 to $3 for all deliveries; Virginia 72-hour foundry at $3 to $3.25, ovens, and Virginia furnace at $2.50 to $3, ovens on contract.

The freight rate to East St. Louis and St. Louis is $2.80, and $2.70 from the Virginia fields, when shipment is destined beyond St. Louis.

## BIRMINGHAM, ALA.

### Greater Movement of Speculative Iron—Some Favorable Features.

Nov. 16.

**Pig Iron.**—There have been no unusual developments to mar the serenity of the pig iron market the past week, as far as the producing interests are concerned. There has probably been some greater movement, at lower figures than the base price of $15.00—which is maintained by the furnace companies for any delivery—of warrant or speculative iron. It is whispered in iron circles that notice has been served by furnace companies for merchants to clear the yards of the iron bought several months ago and piled. The tonnage, however, is comparatively small and even should it all move between now and the first of the year it can be distributed in such a way as to not interfere with the stability of the market from the standpoint of producing interests. Then, again, the books of the furnace companies are in exceptionally good shape for several months ahead; so if there is to be any disturbance in the spot market, it will not necessarily affect the interests that actually produce the pig. Several sales of small lots were made during the week—some for spot delivery, others for delivery into next year. Such sales by iron companies have been on the basis of $15 per ton at the furnace. It is not denied, however, that some tonnage moved promptly at figures somewhat below the base. Low-grade iron still continues scarce, though the premium ban at least, has been annulled. Southern charcoal iron is reported firm at $22.00 per ton at the furnace. In some cases the customary differential of 50c between chilling and non-chilling grades prevails.

**Cast Iron Pipe.**—As is well known, the advance in the price of this product has not been at all commensurate with that of the raw pig; but this fact, so far, has not materially figured in the matter of operation. There comes up from time to time sufficient business to keep the shops running full time. However, one of the large manufacturers here reports that the prospects at present encouraging—both as to the extreme are western business, as well as the local southern business. Of course, it is only a matter of time until an advance must occur. One producer reports the gas pipe market particularly active. Following prices are quoted, f. o. b. cars foundry here: 4 to 12 inch, average of $25.00 per ton with dollar per ton extra for gas-pipe. Fittings, $60 per ton.

**Coal and Coke.**—The demand for both coal and coke has been quite active during the week and the tendency in prices of both has been upward. The brisk demand, to a considerable degree, is brought about by an endeavor on the part of furnaces, foundries, etc., to store a considerable surplus, in anticipation of the imminent car shortage. There have been several conferences held recently in Birmingham by the coal operators in the interest of the employes; and it has been definitely decided to advance wages of miners 2½c per ton, effective December 1, 1909. It is also believed that coke oven and other labor will shortly receive an advance.

## NEW CAR WHEEL PLANT.

The National Car Wheel Co. has purchased two and one-half acres of land on the Lake Shore railroad, on the West Side, Cleveland, where a new plant will be constructed, to begin operating March 1. The company has a plant on Castle road in what was formerly the plant of the Maher & Brayton Foundry Co.

# METAL MARKETS.

## ST. LOUIS.

Nov. 15.

**Lead and Zinc.**—There was a decline in zinc ore in the Missouri-Kansas-Oklahoma district last week from $52 early sales for 60 per cent. ore until a price of $51 was recorded before the close. One choice lot is reported to have brought $55 for 63 per cent. ore and one lot was sold on a $52.50 basis. The Missouri Pacific Railroad Co. furnished more cars than were needed in the Webb City camp, thus making transportation facilities a thing of the past. Quite a number of cars were sent away empty last week, shipments were lighter than they have been for sometime, and a declining market is expected this week. Buyers assert that they can get all the ore they want without inconvenience. Surplus ore is steadily increasing, but on account of floods the output for the district probably will be lower than it was last year.

St. Louis spelter was quoted at $6.27½ Saturday giving indication of a steady demand for metal for sometime to come.

The lead ore market, which was firm at $56 a ton until Saturday, took a toboggan slide until it reached $53 a ton, with producers manifesting anxiety to sell at that figure. St. Louis pig lead was quoted at $4.27½.

Calamine shipments were heavy. Forty per cent qualities sold on a $28 basis, and choice lots brought as high as $35 a ton. The total valuation for the week was somewhat in excess of $300,000.

## CHICAGO.

Nov. 16.

**New Metals.**—A very decided change has taken place in the metal market today, and prices on copper, especially, are much higher, while tin also is stronger and higher. Word comes from New York that the sales of Lake copper there, today, amounted to 8,000,000 or 10,000,000 pounds, practically cleaning up the stocks of some of the dealers in Lake copper. The excitement in the New York market was caused by the reported successful culmination of the efforts to form a merger among strong copper interests. It is said that practically all the large copper-producing interests, including the Amalgamated and the Guggenheim interests, are represented in the merger. The Cal-

umet & Hecla did not join in the movement, it is reported, but this interest always is able to obtain a premium of a few points for its product, over the current market prices, so that there was no absolute necessity for its becoming one of the contracting parties.

We quote as follows: Lake copper, carload lots, 13¾c to 14c; casting copper, 13⅜c to 13½c; smaller lots, ¼c to ¾c higher. Spelter, 6.40c to 6.50c; lead, desilverized, 4.40c to 4.45c in 50-ton lots; corroding, 25c per 100 pounds higher; sheet zinc, $8.00 list f. o. b. La Salle in car lots of 600-pound casks; pig tin, 32c to 32¼c; Cookson's antimony, 10½c; other grades, 9¾c to 10¼c.

**Old Metals.**—There has been a fair run of business in old metals, and a somewhat stronger tone is noticeable, in sympathy with the movement in new metals. Some readjustment of prices is to be noted in present quotations.

We quote dealers' selling prices, as follows: Copper wire, 12¾c; heavy copper, 12¾c; light copper, 11¼c; heavy red brass, 12c; heavy yellow brass, 9⅜c; light brass, 7¼c; No. 1 red brass borings, 10c; No. 1 yellow brass borings, 8c; brass clippings, 9c; tea lead, 3.85c; lead scrap, 4¼c; zinc, 5c; tin pipe, 29c; tin foil, 27c; pewter, 21½c; electrotype plates, free from wood, 4¼c; electrotype dross, 3c; streotype plates, 5c; stereotype dross, 3½c; prime slab zinc dross, $75 per ton.

## NEW YORK.

Nov. 16.

**Copper.**—The market has advanced rapidly during the week and is extremely firm at a level considerably above that reported a week ago. The advance has come largely through the circulation of rumors that a merger of the larger producing interests is about to be consummated. These reports lack confirmation, but persist in various forms and have advanced the stock of copper companies several points. On the metal exchange Tuesday 100 tons of standard copper sold at 13⅛c for February delivery. On the open market, Lake is holding at 13⅜c to 13⅝c, Electrolytic at 13⅛c to 13½c and casting at 12⅞c to 13⅛c. The fortnightly statistics from London show a further increase in surplus supplies during the first half of the month, the visible supply now being 102,955 tons.

**Pig Tin.**—The market is barely steady and shows no important activity, although a fair volume of current business is noted at about 30¾c.

**Pig Lead.**—The situation shows little change from that reported a week ago, continuing fairly strong, with spot metal selling on the basis of 4.40c, New York delivery.

**Spelter.**—In the absence of active buying, the market has shaded off slightly and the limited business now being done is on the basis of 6.30c to 6.40c, New York.

**Antimony.**—We quote: Cookson's, 8⅜c to 8½c; Hallett's, 8c to 8¼c; outside brands, 7½c to 7¾c.

## ORE SHIPMENTS

### Reduced Owing to Accident at Poe Dock—Great Care in Navigation.

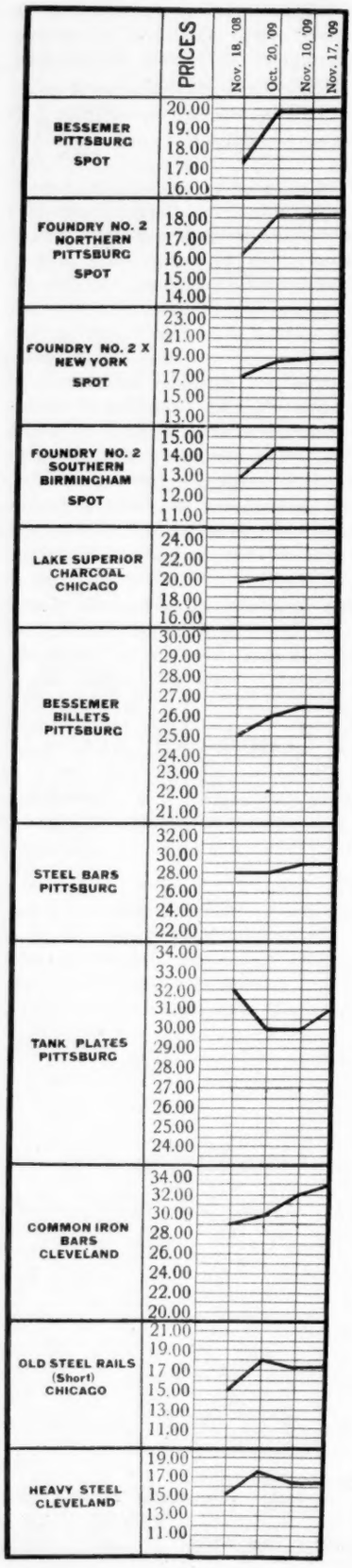
The week in lake circles has been one of dramatic intensity and both vessel owners and shippers have had an exciting time of it. Emphasis was given to the need of another lock at the Sault when the steamer Isaac L. Ellwood, of the Pittsburg Steamship Co.'s fleet rammed the upper gate of the Poe lock on the American side on Nov. 10 and put it out of commission. The damage has not yet been repaired, though it is hoped to restore the lock to working order during the present week.

The accident has, however, sharply cut down the capacity of the available fleet, probably over 20 per cent. In fact, the average rate for lockage through the Canadian lock is 24 hours and as high as 70 vessels have been waiting to be locked through.

The accident has, of course, cut down ore shipments heavily, but shippers still hope to move 5,000,000 tons during the present month. They have been favored with mild weather, as it was not until Nov. 15 that the ore began to freeze in the pockets. No change has occurred in the rate for prompt loading, though $1 has been offered for a cargo from Marquette to be moved during the latter part of the month. The congestion at the Sault made navigation difficult and extraordinary care has to be taken by masters to avoid accidents.

Manufacturers of bolts and nuts have reaffirmed prices, but a further advance is practically assured a month later. This means that the bulk of contracting for next year will be done immediately at current figures.

## PRICE CHART.



# NEW RECORDS

## ESTABLISHED IN PRACTICALLY ALL LINES

### By Steel Corporation Plants Last Month — Great Production of October, 1906, Exceeded in Many Cases.

The enormous production in practically all lines of iron and steel manufacture is reflected by the fact that during October the United States Steel Corporation and its subsidiaries established 141 new records, distributed as follows:

| | |
|---|---|
| Carnegie Steel Co. | 51 |
| Illinois Steel Co. | 19 |
| National Tube Co. | 35 |
| American Steel & Wire Co. | 16 |
| American Sheet & Tin Plate Co. | 6 |
| American Bridge Co. | 2 |
| Tennessee Coal, Iron & Railroad Co. | 8 |
| Universal Portland Cement Co. | 2 |

Interest naturally centers in the Corporation records on furnace products and steel ingots, corrected returns for which make them respectively 1,234,275 tons and 1,409,465 tons. In many instances, the records broken were those established in October, 1906, which was one of the most active months in the history of the industry. The new record for the No. 1 open-hearth furnace at the Ensley works of the Tennesee company is a world's record for an open-hearth furnace, so far as is known.

It must be noted that in many instances records were established by plants not of a strictly modern type, which had been placed in operation to meet the urgent demand for iron and steel. Typical instances are the records of the Clairton open-hearth works, of the Bessemer department of the Shoenberger works, and of the Columbus blast furnace. A number of the most interesting records, together with those supplanted and the date at which the latter were established, are given below:

| | Oct. '09. | Best previous. | Date of old record. |
|---|---|---|---|
| Tennessee Coal, Iron & Railroad Co.: | | | |
| Ensley works, No. 1, O. H. furnace | 11,007 | 8,269 | Aug. '08 |
| All works—Pig iron | 73,158 | 69,350 | Oct. '09 |
| American Steel & Wire Co.: | | | |
| Shoenberger works (Bessemer department) | 31,076 | 30,953 | Nov. '04 |
| Illinois Steel Co.: | | | |
| Joliet Bessemer—Ingots | 61,363 | 60,595 | May '09 |
| Joliet—By-product ovens (280) | 84,455 | 84,296 | Aug. '09 |
| Total furnace products | 249,592 | 239,691 | Sept. '09 |
| Corporation: | | | |
| Total furnace products | 1,234 275 | 1,134,370 | Sept. '09 |
| Ingots | 1,409,465 | 1,302,074 | Sept. '09 |
| Carnegie Steel Co.: | | | |
| Columbus furnace, No. 2 | 8,935 | 8,453 | Jan. '02 |
| Columbus total | 16,734 | 16,695 | Nov. '05 |
| Clairton Steel Works: | | | |
| 12 O. H. | 63,761 | 58,038 | Oct. '06 |

## TEN THOUSAND CARS

### Ordered by Pennsylvania Railroad—Will Also Build Locomotives.

New York, Nov. 17 (By Wire).

The Pennsylvania railroad has ordered 10,000 steel cars, and has instructed its Altoona shops to build 73 locomotives and a number of steel dining cars. For the eastern lines of the company 3,500 hopper gondola coal cars and 500 steel underframe flat cars were ordered from the Pressed Steel Car Co., and 1,000 hopper gondola coal cars from the Standard Steel Car Co. For the lines west of Pittsburg 2,500 steel coke cars, 1,500 gondola cars and 500 box cars were ordered from the Pressed Steel Car Co., and 500 box cars from the Ralston Car Co. These orders are in addition to the orders for the regular replacements on the 1909 and 1910 schedules, for which 16,000 cars had already been ordered since the first of the year.

The coke cars for the lines west are designed with triple hopper bottoms and expanded metal tops, which may be loaded to a capacity of 140,000 pounds. To obtain this capacity the car must be equipped with steel wheels and heavier trucks than under the ordinary steel cars. The Pennsylvania lines west, in their recent orders have specified the larger upper parts, but with the ordinary cast iron wheels and trucks the rated capacity of the equipment is 100,000 pounds. The Pressed Steel Car Co. has also taken 500 gondolas from the Northern Pacific.

## CREDITORS WILL TAKE PLANT.

Plans have been completed whereby the property of Milliken Bros., Inc., which went into receivership in 1906, will be taken over by the creditors' committee. Their reorganization plan has been put into operation by the election of Edward C. Wallace, one of the voting trustees, as president, with the following board of directors: Gates W. McGarrah, John T. Bourne, Arthur A. Fowler, Clarence McK. Lewis, Charles H. Zehnder, William Barclay Parsons and Mr. Wallace. It is understood that the fabricating plant will be operated, although the receivers had given notice that it would be shut down Dec. 1. Only the bridge and structural shop has been in operation of late, but the open-hearth steel plant and finishing mills have been well cared for and are in good condition.

## CHANGES RUMORED AT EASTERN PENNSYLVANIA PLANTS.

Reports of important changes affecting several iron and steel manufacturing interests in eastern Pennsylvania have been in circulation of late. One was to the effect that negotiations had practically been consummated whereby an important merchant furnace plant was to be sold to a neighboring steel works now dependent upon the outside market for its pig iron supply; denial is given this report by both the parties concerned. The rumor has also been in circulation that two of the larger merchant furnace interests in that district were considering the addition of finishing mills. So far as one of these interests is concerned, there is apparently no foundation for the report as the matter has not been considered seriously. In the case of the other, however, it is understood that such a plan has been and is still under advisement, though nothing definite has been decided upon.

## ELECTRIC FURNACE AT LEBANON.

The American Iron & Steel Mfg. Co., Lebanon, Pa., announces that it will install a plant for the production of 50,000 to 60,000 tons of steel billets per annum in an electric furnace. This will be consumed entirely in the finishing mills of the company and no part will be offered for sale, either as billets or as merchant bars. The type of furnace to be employed has not been decided upon and other plans are as yet indefinite, although it is understood that the total expenditure may reach $500,000.

William Wieman has severed his connection with G. P. Bassett Jr., Pittsburg, pig iron and coke, and is now associated with the firm of Banning, Cooper & Co., Ltd., Pittsburg. The change was effective Nov. 16.

F. P. Jones, general manager of the Dominion Iron & Steel Co., Ltd., has resigned to become general manager of the Canada Cement Co.

# WORKMEN'S INSURANCE AND PENSIONS DISCUSSED BY NATIONAL FOUNDERS' ASSOCIATION

Workmen's insurance and pension systems were discussed at the Wednesday morning session of the convention of the National Founders' Association, held at the Hotel Astor, New York, Nov. 9 and 10. T. L. Richmond, Buffalo Scale Co., Buffalo, outlined a plan for insuring workmen, which has been adopted by the Employers' Association of Buffalo. Considerable difficulty was experienced in securing a company that would assume the liability of a life, accident and health policy, but finally a proposition was made by the Phoenix Accident Insurance Co., Detroit, which was accepted. A rate of $1.00 per month was made for disability due to accident or sickness, and a small sum is also paid after death. Free medical attendance is provided, and policies are also written at the rate of 50 cents per month, insuring only half benefits. Owing to the fact that a large number of policies were issued at one time, the insurance company paid a premium of 20 per cent to the Employers' Association, and the sum thus realized is used as a fund from which death benefits are paid. During the first year, it was decided to pay only $100, but larger death benefits can undoubtedly be allowed in future years, as the fund realized from the commission is increased. Before this insurance plan was adopted, the approval of the New York State Insurance Department was obtained, thus forestalling any opposition which might have arisen, based on the alleged illegality of the plan. The labor organizations offered little objection, as it was shown that this plan was of real advantage to the workman, particularly as the rates were lower and the benefits greater than could be obtained from any other source. Although the first policy was only written in March this year, 1,200 have already been issued, and in one Buffalo shop, 60 per cent of the men are thus insured.

### Deere & Co.'s Insurance Fund.

Another benefit insurance fund, inaugurated by Deere & Co., Moline, Ill., was discussed by Wm. Butterworth, of that concern. He explained that both the insurance and pension plans were adopted after a strike which, for a considerable period, closed practically all of the large shops in Moline, Rock Island and Davenport. In the plant of Deere & Co., prior to the strike, only union labor was employed, and the average daily wage amounted to $2.21, but since the strike, open shop conditions prevailing, the average wage has increased to $2.68 per day. Every employe of Deere & Co. paid through the weekly pay-roll, derives the benfits from the insurance fund as soon as he signs a contract and begins work for the company. The employes are assessed at the rate of 50 cents per month, the same amount being paid by the company for each of the workmen on the pay-roll. Half of this amount is, however, charged employes rated at less than 15 cents per hour. Sick benefits are paid at the rate of $1.00 per day for a period of 60 days to those afflicted with chronic troubles and 180 days for other diseases. Free medical attendance is provided, and the death benefit is $100. For disability, due to accident, $1.00 per day will be paid for 12 months, and for injuries resulting in death before the expiration of the benefit period previously referred to, $1,000 is paid. For injuries resulting in the loss of both hands or both feet, or one hand and one foot, $1,000 is paid, and for the loss of one hand or one foot, $500. For injuries causing total loss of sight of both eyes, $1,000 is paid, and $250 for the loss of the sight of one eye.

### Pension System.

The pension system has no connection with the sick benefit insurance, and is given by Deere & Co. without cost to its employees. All employees engaged in any capacity in the operations of this concern, who have reached the age of 65 years and have been 20 or more years continuously in the service, may be retired and become eligible to a pension. Any employe who has been ten years or more continuously in the service of this concern, and has, by reason of injury or sickness, become totally incapitated for further work, may or may not receive aid from the pension fund, at the discretion of the company. No person entering the employ of this concern later than the age of 45 years is eligible to a pension. The annual pension allowance is 1½ per cent of the average annual pay during the ten years next preceding retirement, except that no pension less than $18 per month is allowed. The acceptance of a pension shall not prevent any retiring employe from engaging in any business which, in the judgment of the pension board, is not prejudicial to the company, nor is assignment of the pension allowances permitted.

Marshall Cushing, the legislative representative of the National Founders' and National Metal Trades Associations in Washington, discussed at some length the work that had been done in opposition to class legislation, such as the proposed special measures of many labor organizations. The report of a special finance committee, consisting of O. P. Letchworth, H. Woodland and G. E. Emmons, was referred to the administrative council.

### Annual Dinner.

The annual banquet of the association was held at the Hotel Astor, Tuesday evening, T. J. Drummond, Montreal, presiding. Addresses were delivered by W. H. P. Faunce of Brown University, Providence, R. I., and ex-Governor Utter of Rhode Island. Ex-Congressman Littlefield, now of New York City, John Kirby Jr., Dayton, president of the National Association of Manufacturers, and H. P. Eells, Cleveland, president of the National Metal Trades Association, were called upon after the regular addresses.

### Election of Officers.

The report of the nominating committee was presented Wednesday afternoon. O. P. Briggs, Minneapolis, vice president during the past year, was again the unanimous choice of the members of the association for the presidency. This honor was bestowed on Mr. Briggs in recognition of his able services in behalf of this organization, he having previously served as its executive for several consecutive terms. The election of officers and members of the district committees resulted as follows:

President, O. P. Briggs, Minneapolis; vice president, Charles M. Jarvis, American Hardware Corporation, New Britain, Conn.; secretary, F. W. Hutchings, Detroit; treasurer, Peoples State Bank, Detroit; commissioner, A. E. McClintock, Detroit.

### District Committees.

FIRST DISTRICT.

F. D. Wanning, Birmingham Iron Foundry, Derby, Conn.; J. F. Lanigan, Davis Foundry Co., Lawrence, Mass.; Thos. W. Fry, Sullivan Machinery

Co., Claremont, N. H.; Henry B. Sargent, Sargent & Co., New Haven, Conn.; E. A. Jones, E. D. Jones & Sons Co., Pittsfield, Mass.

SECOND DISTRICT.

H. D. Miles, Buffalo Foundry & Machine Co., Buffalo; G. H. Johnson, Isaac G. Johnson & Co., Spuyten Duyvil, N. Y.; S. L. Moore, Moore Bros. Co., Elizabethport, N. J.; Norman J. Gould, Gould's Mfg. Co., Seneca Falls, N. Y.; F. E. Wheeler, International Heater Co., Utica, N. Y.

THIRD DISTRICT.

J. H. Schwacke, Wm. Sellers & Co., Inc., Philadelphia; W. R. McClave, McClave-Brooks Co., Scranton, Pa.; Stuart R. Carr, Stuart R. Carr & Co., Baltimore; Thomas Shipley, York Mfg. Co., York, Pa.; George Mesta, Mesta Machine Co., Pittsburg.

FOURTH DISTRICT.

Omar N. Steele, American Shipbuilding Co., Cleveland; R. H. Jeffrey, Jeffrey Mfg. Co., Columbus; William Gilbert, Buckeye Foundry Co., Cincinnati; Irving H. Reynolds, Wm. Tod Co., Youngstown, O.

FIFTH DISTRICT.

Edward H. Dean, Dean Bros. Steam Pump Works, Indianapolis; H. T. Hornsby, United Iron Works Co., Springfield, Mo.; D. F. O'Neil, Western Foundry Co., Chicago; W. O. Bates, Bates Machine Co., Joliet, Ill.; F. C. Caldwell, H. W. Caldwell & Son Co., Chicago.

SIXTH DISTRICT.

Otto H. Falk, The Falk Co., Milwaukee; Oliver Crosby, American Hoist & Derrick Co., St. Paul; Theodore O. Vilter, Vilter Mfg. Co., Milwaukee; Frederick Robinson, J. I. Case Threshing Machine Co., Racine, Wis.; A. J. Brawley, South Park Foundry & Machine Co., St. Paul.

SEVENTH DISTRICT.

S. H. Chapman, Ontario Wind Engine & Pump Co., Ltd., Toronto; J. A. Milne, Allis-Chalmers-Bullock, Ltd., Montreal; L. L. Anthes, Toronto Foundry Co., Ltd., Toronto; C. H. Waterous, Waterous Engine Works Co., Ltd., Brantford, Ont.; J. A. Kilpatrick, Canada Iron Corporation, Ltd., Hamilton, Ont.

EIGHTH DISTRICT.

Wm. J. Oliver, Wm. J. Oliver Mfg. Co., Knoxville, Tenn.; W. D. Tynes, Hardie-Tynes Mfg. Co., Birmingham, Ala.; G. T. Thayer, South Side Foundry & Machine Works, Charleston, W. Va.; W. S. Mosher, Mosher Mfg. Co., Dallas, Texas; Exile Burkitt, Southern Engine & Boiler Works, Jackson, Tenn.

## OLD TIME MINES

### Will Soon Resume Operations—Development of the Swanzey District.

Republic, Mich., Nov. 15.—There having been effected a settlement of the litigation involving the title to the tract, the development of the northwestern property in the Swanzey district of the Marquette iron range is to be proceeded with after having been suspended for upwards of a year. The Chicago & Northwestern railway gave the Cleveland Cliffs Iron Co. an option on a large acreage in the Swanzey field in 1903, and when diamond drills had shown the existence of ore, the development of a number of deposits was undertaken. Work was well along at the Northwestern when the litigation arose. Under the settlement three Marquette county men who held tax titles to the tract will convey their interest to the Chicago & Northwestern company and will receive in return a royalty of 10 cents a ton for all the ore mined in the 40 acres in dispute.

Within a few months, mining operations will be resumed at three old-time Negaunee properties. The Breitung interests are preparing to begin work at the Milwaukee and Davis mines, and the Cleveland-Cliffs Iron Co. is to reopen the Lucy. The greater part of the winter will be spent in preparatory operations and it is expected that all three properties will be producing ore early next season. During the past few days a cargo of 2,000 tons of silicious ore has been shipped from the old open pit at the Jones & Laughlin Steel Co.'s Rolling Mill mine at Negaunee. It was the first product taken from the open pit in four years. Silicious ores are in better demand now than for a long time past, and it is expected that a considerable tonnage will be mined at the Rolling Mill next season.

There are large bodies of these silicious ores on the Marquette range, and in many cases the conditions are such that their mining is easy and cheap, there being no water to pump or expensive methods to be employed in getting the product into the railway cars. Open pit mining is the system generally employed.

## OUR EXTRAORDINARY PIG IRON PRODUCTION.

Commenting on the large pig iron production the *Bulletin* of the American Iron and Steel Association says:

Our latest published statistics of the world's production of pig iron are for the year 1906, when we placed the total production at 58,650,000 tons, of which the United States made 25,307,101 tons, or 43.15 per cent. We have recently compiled but not published the statistics of the world's production of pig iron in 1907, which we find to have amounted to 60,382,000 tons, the United States producing 25,781,361 tons, or 42.7 per cent. At the rate of production we attained in October when we were making pig iron at the rate of 31,000,000 tons annually, our percentage of the world's production was then at the rate of over 50 per cent of the production in 1907, but this must not be understood to mean that in the whole year 1909 we will make over 50 per cent of the world's production in 1909. We will make much less than 50 per cent. The world's production of pig iron this year will amount to 61,000,000 tons, or possibly 61,500,000 tons.

## PHOENIX IRON WORKS EXTENSION.

The Phoenix Iron Co., Phoenixville, Pa., has recently completed a 100-ton open-hearth furnace. The rumor which has been current to the effect that it will roll tees and small angles up to 2½ by 2½ inches is incorrect, but evidently had its foundation in the fact that for the past three months the small mill has not been operated, the steel capacity being sufficient only for the larger mills rolling the sizes most in demand.

## TIRE PLANT NEARING COMPLETION.

The Inter-Ocean Steel Co., Chicago, which is building a plant for the manufacture of locomotive tires, at Chicago Heights, has been delayed in the construction of the buildings and the installation of the machinery. It was expected that operation of the mill would commence by Jan. 1, 1910, but this will not be possible before February. The buildings are nearly completed, the machinery purchased, and a portion of it erected, while some of it is just being shipped.

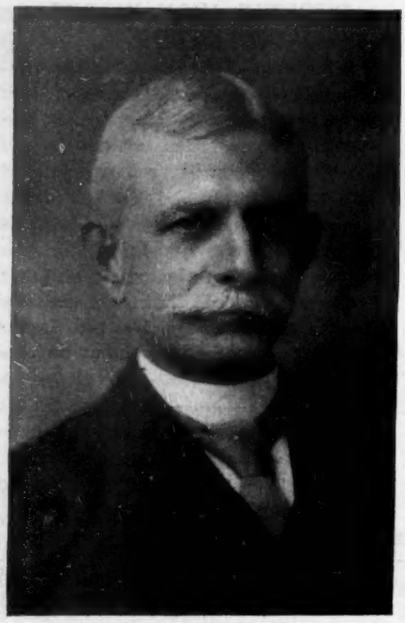
## COAL PROPERTIES TAKEN OVER.

Following negotiations extending over fully six months, the United States Steel Corporation has taken over the Hammond Coal Co. properties in the Danville, Ill., district, consisting of about 27,000 acres of coal lands and including the well-known Kelly mines at Danville. Several other important coal tracts in the immediate district were also secured, the consideration being in the neighborhood of $2,000,000.

## DEATH OF CAPT. THOMAS GREEN BUSH.

Capt. Thomas Green Bush, one of the best known iron manufacturers of the south, died Nov. 11 at Birmingham, Ala., while playing golf at the Country Club, the cause of death being apoplexy. He was one of Alabama's representative men, both in business and public life, and his benefactions were numerous.

Capt. Bush was born in Pickens county, Ala., on his father's estate, in 1847, a son of Albert and Sarah A. Bush. His childhood was spent in Pickens county and Mobile, his father in 1852 engaging in the cotton commission business at Mobile. At the age of 14 he entered the University of Alabama, but two years later left to take part in the Civil



CAPT. T. G. BUSH.

War. He organized two military companies, in 1863, and in 1864 was adjutant of the corps of cadets which was ordered into service the same year. He left the service of the cadets, and entered the regular Confederate army as adjutant of the 52nd Alabama, and in May, 1865, he was held a prisoner of war, later being exchanged and finally parolled. When the war closed, he entered the University of Mississippi, from which he was graduated, finally entering the cotton commission business with his father in Mobile. In 1871, he established the wholesale grocery business at Mobile of T. G. Bush & Co. In 1866 he became president of the Mobile & Birmingham railroad, and served for several years as the first president of the Mobile Chamber of Commerce. He had served as president of the Shelby Iron Co., the Clifton Iron Co., the Woodstock Iron Co., the First National Bank of Anniston, the Anniston Water Co., the Alabama Consolidated Coal & Iron Co., the Coosa Pipe & Foundry Co., the Gadsden Pipe & Foundry Co., and the Imperial Coal & Coke Co. He was a member of the Alabama legislature in 1886-87, and was chairman of the ways and means committee. President Roosevelt named him a member of the International Peace Commission at one time. Five children were born to Mr. and Mrs. Bush, one of whom, Morris W. Bush, is general superintendent of the Woodward Iron Co.

## OBITUARY.

Emerson O. McLean, president of the Roderick Lean Mfg. Co., died Nov. 10 at his home in Mansfield, O. Mr. McLean was born in Shakespeare, Canada, July 7, 1861, the oldest son of Roderick Lean, pioneer in the manufacture of steel harrows, and founder of the concern which now bears his name. The business was established in Stratford, Ont., in 1868, but was moved to Mansfield, O., its present location, in 1876. Mr. McLean assisted his father in the manufacture and sale of harrows, later becoming a traveling representative for a hardware and saddlery house in Indianapolis, but in 1878 returned to Mansfield to associate himself again with his father in the manufacture of harrows. The firm at that time was Roderick Lean & Son. In 1893 the father moved to California on account of his health and at the same time the firm was changed to a corporation, the Roderick Lean Mfg. Co., with Emerson O. McLean as its president. To his foresight and business ability the present success of the company is ascribed. Because of illness the past 18 months, he had not assumed active charge of the business.

B. Treppe, formerly manufacturer of ornamental iron at Milwaukee, and for the past 13 years in the same line of manufacture at La-Crosse, Wis., died Nov. 8, aged 56.

## PERSONAL.

R. H. Wolff, representative in the United States of the Heroult electric steel furnace, has returned from a brief European visit.

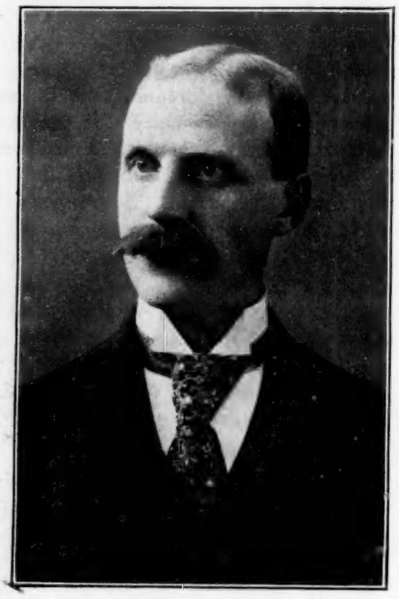
Samuel E. Bliss, president of Bliss & Laughlin, Inc., Chicago, manufacturers of steel shafting, was elected to the presidency of the Metropolitan Trust & Savings bank, a few days ago, to fill the vacancy caused by the unexpected death of James H. Gilbert. Mr. Bliss has been vice-president of the bank since 1906.

J. Lloyd Uhler, metallurgist of the Union Steel Casting Co., Pittsburg, is seriously ill with typhoid fever at Mercy hospital, Pittsburg.

Charles Rice, formerly of Canal Dover, O., has been appointed superintendent of the Canton, O., plant of the American Sheet & Tin Plate Co., which has resumed operating.

Michael Weisner has been appointed superintendent of the West Allis Malleable & Chain Belt Co., West Allis, Wis., to succeed Charles Ratsch, resigned. Mr. Ratsch will soon leave for Vespers, Wis.

T. C. Rogerson, formerly general



EMERSON O. MCLEAN.

foreman at the C. P. & St. L. shops at Jacksonville, Ill., has been appointed general foreman of the Duncan Foundry & Machine Co. at Alton, Ill.

Charles C. Linthicum, professor of patent law in Northwestern University law school, and member of a Chicago law firm, has been appointed general patent counsel for the United States Steel Corporation, succeeding the late Thomas W. Bakewell, of New York and Pittsburg. The offices of the general patent counsel will be removed from New York to Chicago.

## COPPER ADVANCES.

New York, Nov. 17.—The United Metals Selling Co. advanced the price of copper to 13½c, an advance of ¼c from yesterday.

# Money Rates Ruled Stock Market

Money conditions continued to be the largest factor in the stock market in the past week.

Monday, no change was made in the Imperial Bank of Germany discount rate; the stock market was irregular, Amalgamated copper and Pittsburg Coal advancing to the highest prices of the year. Tuesday, call money advanced to 5½ per cent; the stock market after ruling dull became weak and closed lower; the foreign copper market was firmer and higher, domestic prices remaining unchanged. With the advance of call loans to 6 per cent Wednesday, the stock market was lower at the opening; but with the later easing of call money, stocks rallied. Thursday's market was dull and irregular; the Bank of England rate of discount remained at 5 per cent. Friday's market was dull and narrow; the wheat market was strong and higher. Extreme dullness distinguished Saturday's market, copper stocks showing strength and activity.

The advance of call money to 6 per cent established the high rate since the opening of October. The week's low rate was 3¼ per cent; it was nominally 5 per cent Saturday. Time money showed a firmer tendency throughout the week; gold exports amounted to $1,304,000. Bank clearings show a moderate decline in volume compared with the week preceding, in New York a decline of 7¼ per cent, because of lesser stock market activity.

Saturday's New York bank statement genuinely surprised the street, for instead of the extreme cash loss expected, the actual surplus reserve showed an increase of $4,350,775, bringing the total surplus up to $11,243,900. The actual figures of clearing house banks showed surplus decreased $6,603,275; loans increased $6,624,600; deposits decreased $2,071,100, and the percentage of reserve 25.4, a loss of 0.5. Non-member banks and trust companies showed loans decreased $4,671,700; net deposits decreased $7,510,900 and the percentage of reserve, 17.3 unchanged.

Commercial failures for the week were 233, compared with 249 the previous week, and 264 the corresponding week last year. Shares were sold to the number of 2,393,359, compared with 3,762,400 the preceding week, and 8,437,600 the corresponding week last year. Bonds, exclusive of government bonds, were sold to the amount of $679,000, compared with $1,164,000 the preceding week, and $956,000 the corresponding week last year.

## THE LEADING INDUSTRIAL SECURITIES.

| | Closing Quo. Nov. 13 | Changes in week | Date 1909 Ann. | M't'g. | Stock Outstanding | Basis | Dividend Last Declared | Date Last Div. Pay. |
|---|---|---|---|---|---|---|---|---|
| Allis-Chalmers | 15½ | — ⅛ | Sept. | 2 | $19,820,000 | | 2½ Q. | ..... |
| Allis-Chalmers, pr. | 53⅜ | —1 | | | 16,150,000 | 7 cum. | ..... | Feb., 1904 |
| American Can | 14¼ | +1⅜ | Feb. | 2 | 41,233,300 | | 1¾ Q. | ..... |
| American Can, pr. | 84½ | +1½ | | | 41,233,300 | 7 cum. | ..... | Oct., 1909 |
| Am. Car & Fdy | 74⅜ | — ⅜ | June | 24 | 30,000,000 | | 1¾ Q. | Oct., 1909 |
| Am. Car & Fdy., pr. | 119⅜ | — ½ | | | 30,000,000 | 7 n. c. | ½ Q. | Oct., 1909 |
| American Loc. | 62 | — ⅛ | Oct. | 19 | 25,000,000 | 5 | 1¼ Q. | Aug., 1908 |
| American Loc., pr. | 116 | ..... | | | 25,000,000 | 7 cum. | 1¾ Q. | Oct., 1909 |
| American Ship | 67⅜ | ..... | Oct. | 13 | 7,600,000 | 4 | 1¾ Q. | Oct., 1908 |
| American Ship, pr. | 110½ | ..... | | | 7,900,000 | 7 cum. | 1 Q. | Sept., 1909 |
| Am. Steel Foundries(new) | 65½ | + ⅛ | Dec. | 2 | 17,184,000 | | 1¾ Q. | ..... |
| Barney & Smith | 40 | +10 | June | 1 | 2,000,000 | 4 | ..... | Sept., 1907 |
| Barney & Smith, pr. | 105 | +5 | | | 2,500,000 | 8 cum. | 1 Q. | June, 1908 |
| Bethlehem Steel | 34¼ | — ¼ | April | 6 | 14,862,000 | | 2 Q. | ..... |
| Bethlehem Steel, pr. | 67 | — ½ | | | 14,908,000 | 7 n. c. | ..... | Feb., 1907 |
| Cambria Steel | 47½ | +1 | Mar. | 16 | 45,000,000* | 3 | ¾ Q. | Aug., 1909 |
| Cambria Iron | 46⅝ | + ⅜ | | | 8,468,000* | 4 | 1½ S. A. | Sept., 1909 |
| Chicago Pneumatic Tool | 38⅛ | — ⅞ | Feb. | 15 | 6,145,000 | 4 | 2 S. A. | Oct., 1907 |
| Colorado Fuel | 48½ | —1½ | Oct. | 18 | 34,235,500 | | 1 Q. | April, 1902 |
| Crucible Steel | 13½ | — ⅜ | Oct. | 20 | 24,578,400 | | 3½ | ..... |
| Crucible Steel, pr. | 83⅝ | — ¼ | | | 24,436,000 | 7 cum. | 1½ Q. | Sept., 1909 |
| Empire Steel | 12 | ..... | April | 27 | 1,254,770 | | 1 Q. | ..... |
| Empire Steel, pr. | 71 | ..... | | | 2,500,000 | 6 cum. | ..... | July, 1909 |
| Fay & Egan | 90 | ..... | Feb. | 18 | 1,000,000 | 7 | 3 S. A. | Nov., 1908 |
| Fay & Egan, pr. | 110 | ..... | | | 1,000,000 | 7 cum. | 1¾ Q. | Aug., 1909 |
| General Electric | 162 | — ⅛ | May | 11 | 65,179,600 | 8 | 2 Q. | Oct., 1909 |
| Harbison-Walker | 32 | ..... | Jan. | 18 | 18,000,000 | | 3 Q. | Oct., 1907 |
| Harbison-Walker, pr. | 95 | ..... | | | 9,600,000 | 6 cum. | 1½ | Oct., 1909 |
| International Pump | 53½ | +1¾ | June | 8 | 17,762,500 | | 1½ Q. | April, 1905 |
| International Pump, pr. | 90¼ | — ⅛ | | | 11,350,000 | 6 cum. | 1½ | Nov., 1909 |
| Lackawanna Steel | 60 | ..... | Mar. | 10 | 34,971,400 | | 1½ Q. | ..... |
| Lake Sup. Corp. | 27⅝ | + ⅛ | Oct. | 6 | 40,000,000 | | ..... | ..... |
| New York Air Brake | 95 | +1⅛ | June | 17 | 10,000,000 | 8 | ..... | Oct., 1907 |
| Niles-Bement-Pond | 108 | ..... | Feb. | 3 | 8,500,000 | 3 | 2 Q. | Sept., 1909 |
| Niles-Bement-Pond, pr. | 104 | ..... | | | 2,000,000 | 6 cum. | 1½ Q. | Aug., 1909 |
| Otis Elevator Co | 55 | ..... | Mar. | 15 | 6,375,300 | | 1½ Q. | Oct., 1909 |
| Otis Elevator Co., pr. | 98 | +2 | | | 6,295,000 | 3 n. c. | 1½ S. A. | Oct., 1909 |
| Pa. Steel | 65 | —5 | May | 10 | 10,750,000 | | 1½ Q. | ..... |
| Pa. Steel, pr. | 116 | — ½ | | | 16,500,000 | 7 n. c. | 3½ S. A. | Nov., 1909 |
| Pittsburg Coal Co | 26 | — ⅜ | Mar. | 9 | 32,000,000 | | 3½ S. A. | ..... |
| Pittsburg Coal Co., pr. | 68 | —2 | | | 32,000,000 | 7 n. c. | ..... | April, 1905 |
| Pressed Steel Car | 53¾ | + ¾ | Feb. | 17 | 12,500,000 | | 1 Q. | Aug., 1904 |
| Pressed Steel Car, pr. | 105½ | —2 | | | 12,500,000 | 7 n. c. | 1¾ Q. | Aug., 1909 |
| Pullman | 192⅞ | — ⅝ | Nov. | 10 | 100,000,000 | 8 | 2 Q. | Aug., 1909 |
| Railway Stl. Spring | 49½ | — ¾ | Mar. | 4 | 13,500,000 | 2 | 1 S. A. | Oct., 1908 |
| Railway Stl. Spring, pr. | 108 | +1 | | | 13,500,000 | 7 cum. | 1¾ Q. | July, 1909 |
| Rep. Iron & Steel | 48 | + ¼ | Oct. | 20 | 27,191,000 | | ..... | ..... |
| Rep. Iron & Steel, pr. | 106¼ | + ½ | | | 20,416,900 | 7 cum. | 2½ Q. † | Oct., 1909 |
| Sloss-Sheffield | 92 | +1 | Mar. | 10 | 10,000,000 | 5 | 1¼ Q. | Sept., 1909 |
| Sloss-Sheffield, pr. | 119 | ..... | | | 6,700,000 | 7 n. c. | 1¾ Q. | Oct., 1909 |
| U. S. Pipe & Fdy. Co. | 33 | —1 | June | 23 | 12,106,300 | 2 | 1 Q. | Dec., 1907 |
| U. S. Pipe & Fdy., pr. | 87 | ..... | | | 12,106,300 | 7 n. c. | 1¾ Q. | Sept., 1909 |
| U. S. Steel | 90½ | — ⅜ | April | 19 | 508,302,500 | 3 n. c. | ¾ Q. | Sept., 1909 |
| U. S. Steel, pr. | 126 | — ½ | | | 360,281,100 | 7 cum. | 1¾ Q. | Aug., 1909 |
| U. S. Steel, 5s | 105 | — ⅜ | | | 463,398,000 | 5 | 1¼ Q. | ..... |
| Va. Iron, Coal & Coke | 71 | +1 | Sept. | 21 | 9,073,680 | | 5 A. | ..... |
| Westinghouse Elec. | 85 | —1½ | June | 16 | 27,173,200 | 10 | 2½ Q. | Oct., 1907 |
| Westinghouse Air Brake | 142 | ..... | Oct. | 5 | 14,000,000 | | 2½ Q. | Oct., 1909 |

Par value of shares, $100, except those starred (*), $50.
†Includes deferred dividend of ¼ of 1 per cent.

### Copper Stocks.

**New York.**—Amalgamated Copper closed 91, a net gain of 4¼.

**Boston.**—Butte Coalition closed 29⅝, a net gain of ⅛; Calumet & Arizona closed 101, no change; Calumet & Hecla closed, 660, a net loss of 8; North Butte closed 60⅜, a net gain of ⅜; Quincy Mining closed 87, a net gain of 1.

### Financial Notes.

The Quincy Mining Co. declared the usual quarterly dividend of $1 a share, payable Dec. 20; the United States Cast Iron Pipe & Foundry Co., the usual quarterly dividend of 1¾ per cent on preferred, payable Dec. 1; the National Smelting & Refining Co., the regular quarterly dividend of 1½ per cent, payable Dec. 1; the Sloss-Sheffield Steel & Iron Co., the regular dividend of 1¼ per cent on common and in addition an extra dividend of three-quarters of 1 per cent, both being payable Nov. 30; the J. A. Fay & Egan Co., the regular quarterly dividend of 1¾ per cent on preferred, payable Nov. 20; the Bessemer & Lake Erie Railroad Co., the regular semi-annual dividend of 3 per cent on preferred, payable Dec. 1. The National Lead Co., the regular quarterly dividend of 1¾ per cent on preferred stock, payable Dec. 15.

# THE IRON TRADE REVIEW

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THE AVERAGE PAID CIRCULATION OF THE IRON TRADE REVIEW FOR THE ISSUES OF THE FOLLOWING MONTHS WAS:

| | |
|---|---|
| January | 5,506 |
| February | 5,346 |
| March | 5,396 |
| April | 5,508 |
| May | 5,533 |
| June | 5,551 |
| July | 5,572 |
| August | 5,597 |
| September | 5,609 |
| October | 5,628 |

November 18, 1909

## THE POLICY OF CONCILIATION.

That the National Founders' Association has not labored in vain in endeavoring to establish peaceful operating conditions in the shops of its members, was indicated by the annual report presented at last week's convention, which recorded labor troubles during the year in only two foundries affiliated with this organization, involving 23 coremakers and molders. Despite depressed business conditions, which to an extent, obviated labor difficulties, it must be considered a wonderful record, and it is especially so when compared with the total of 65 strikes in the shops of non-members declared by the International Molders' Union during the same period. This freedom from labor troubles is again a vindication of the policy of 1904, which has stood the test of the most trying years in the history of the organization, and will be continued by the incoming administration.

The attitude of the association, which is one of conciliation and not antagonism, was concisely outlined in the presidential address. The distinct advantages of adjusting wages voluntarily in prosperous times, to obviate the presentation of demands from labor unions or a committee of employes, were pointed out by the retiring executive, and a constant watchfulness by the employer for changes which he can afford to install was urged, thereby rendering unnecessary the possible making of a formal demand. Attention was also again directed to the growing scarcity of competent molders, and while the education of apprentices is being systematically pursued in the shops of many of the members, the supply of skilled men is at present inadequate to meet the requirements of the industry, and greater effort along educational lines was recommended.

The benefit insurance and pension plans adopted by some of the members of the National Founders' Association, outlined briefly at this meeting, reflect an almost paternal feeling for the welfare of employes by employers, who have in the past been credited by the uninformed "with seeking war," this statement having particular reference to the monumental molders' strike of 1906. In Buffalo, where a health, accident and life insurance plan has been adopted by the Employers' Association, no less than 1,200 policies have been issued to workmen in less than nine months. Viewed with suspicion at first, the benefits of this insurance are now being recommended by the workmen themselves, half of the cost being borne by the employers.

Another instance of the benefits directly derived by the workmen laboring under open shop as compared with closed shop conditions was cited by a large western manufacturer of agricultural implements. When the strike at this plant was declared, which involved approximately 1,200 men, the average daily wage rate, for both laborers and skilled mechanics, was $2.21. Yet, since the adoption of the open shop, the average daily wage rate has rapidly increased, and is now $2.68. In addition to the greater possibilities offered the employes for earning an increased stipend, this concern has inaugurated a pension plan, and has established a benefit insurance fund. The minimum pension paid is $18.00 a month, and from the insurance fund accident, sickness and death benefits, in various amounts, are paid to the employes, half of the fund being maintained by the company and the remainder by the workmen.

The foregoing indicate the improved relations between employer and employe, which invariably follow the removal of the yoke of union domination, thus affording the workman not only greater possibilities for earning higher wages, but better opportunities of improving his condition as well.

## THE ADVANCE IN SHEET PRODUCTS.

The advances in sheet products made late last week by the leading interest are conservative and are more than justified by the advances which have occurred in raw materials. In discussing the tin plate situation a week ago, we noted that the current demand for tin plate, and the prospects, were very good and that the demand would have to be satisfied, no matter what price it was necessary to develop on sheet bars in order to divert the steel to tin plate-making. Although it is officially denied that the Carnegie Steel Co. has made a price of $30, Pittsburg, on such sheet bars as it may be able to spare for first quarter delivery, this quotation is in keeping with the expectations of the steel trade, and it seems practically certain that this will be the price for first quarter sheet bars. The advance from the current market is $2, and this corresponds with the advances made last week of 10 cents per box on tin plate and $2 per ton on black sheets.

Naturally it is interesting to observe that at $30 sheet bars are $2 a ton higher than standard rails, but such comparisons merely serve to illustrate the policy of the rail mills in holding standard rails at a fixed price. The price

of standard rails has not been changed since the advance from $26 to $28 in the spring of 1901, more than eight years ago. There is not another steel product which has not experienced relatively frequent and comparatively violent fluctuations in that period. Even so closely allied a product as light rails has had its variations, having reached $33 in 1906-7, while they dropped a total of $10 a ton to the spring of this year. In 1906 and 1907, both years of excellent demand and of an almost stationary level for steel products as a whole, sheet bars advanced from $26 to $31.

The tin plate market has been freer from fluctuations this year than most finished steel products. At no time has there been any considerable amount of shading of the regular prices. These have merely shown the movement of a reduction of 25 cents per base box in March and advances of 10 cents each in September and the present month. While last week's advance was in keeping with the present advance in sheet bars, tin plate finds itself 5 cents per base box lower than at the opening of the year, while sheet bars may be considered $3 a ton higher.

Black sheets find themselves in the same position as tin plate, relative to the opening prices of the year, having been 2.45c in January and being now 2.40c. The nominal fluctuations of black sheets this year have been the same as those of tin plate, but as to actual market prices the fluctuations were greater, since for a while there was general shading of about $2 a ton, while the tin plate market held firmly, perhaps largely because it was at the height of its season.

Galvanized sheets present a case of their own, since they are affected so largely by the cost of spelter. The average price of spelter from Jan. 1, 1905, to July, 1907, when the market began dropping rapidly, was about 6 cents, East St. Louis. During this time, the spread between black and galvanized sheets, No. 28 gage, varied from $1.05 to $1.15 per 100 pounds. Since the beginning of 1908, however, the alignment has been altogether different. Throughout 1908, spelter averaged well below 5 cents, and in the early months of this year it averaged slightly below 5 cents. Since the rearrangement of sheet prices Jan. 6, 1908, the official spread between black and galvanized sheets, No. 28 gage, has been $1.05 per 100 pounds. Last week's rearrangement made the spread $1.10, while spelter is 6¼ cents, East St. Louis. The relation is not out of keeping with 1905, 1906 and the fore part of 1907, while it is not so well in keeping with the shorter range comparison covering 1908 and the early part of the present year. It is impossible, however, constantly to adjust the lists, for the reason that the amount of spelter consumed in making a given quantity of galvanized sheets varies with each gage, while except when the differentials between gages are rearranged changes in the base price of galvanized sheets fall equally upon each gage, and rearrangements of the differentials are avoided as much as possible on account of the disturbance in the trade.

The advance in spelter has fallen heavily upon the galvanizing trade. In six months spelter has advanced fully 1¼ cents per pound, or $25 per ton. The current consumption in the manufacture of galvanized sheets may be estimated at between 5,000 and 6,000 tons per month, so that the advance means an extra cost of between $125,000 and $150,000 a month to the manufacturers of galvanized sheets. The total consumption of spelter in all industries in the United States has sometimes closely approached 20,000 tons a month.

## THE LATE CAPTAIN BUSH.

The passing away of Capt. T. G. Bush, on the Country Club golf links at Birmingham on last Thursday afternoon, marks the closing of an eventful and brilliant earthly career, both as a private citizen and business man. He stood at the top of the list of southern ironmasters, and the Birmingham district owes much to his memory as a builder and a promoter of great industrial development. Today the Alabama Consolidated Coal & Iron Co. stands out as a monument to his genius and ability for doing things worth while. As an illustration of his ability to untangle great problems, the following quotation is referred to, taken from the final decree of Judge C. D. Clark, judge of the United States District Court of the Eastern District of Tennessee, in the winding up of the affairs of the estate of the Southern Car & Foundry Co.:

I hardly feel like closing the remarks made on this final ruling in this case of so much importance and magnitude without expressing appreciation of the services rendered by the active managing receiver, Mr. T. G. Bush. This bankrupt estate and the unpromising condition of its assets have had a degree of business sagacity and wise management rarely met with. The very limited personal expense account turned in by the managing receiver referred to furnishes a striking lesson of economy and good faith towards a trust estate; and this, with the practical, wise and judicious management of this large estate, combine to show a service, the ability and good faith of which are too manifest not to be acknowledged.

This, within itself, is a monument more impressive and enduring than marble.

## PUDDLERS' WAGES ARE ADVANCED.

The regular bi-monthly examination of the sales sheets of the Republic Iron & Steel Co. and other representative makers, at Pittsburg, Nov. 12, showed the puddling scale during November and December would be based upon a 1.40c card, which would net the puddlers $5.50 per ton during the period considered.

At the last bi-monthly examination the puddling rate was $5.37½, based upon a 1.35c bar iron card. The finishers will also receive an advance of 1 per cent during the next 10 months by reason of the 1.40c card disclosed.

## LOCOMOTIVE ORDERS.

An order for 50 locomotives for the St. Paul system will be filled by the American Locomotive Co. at its Dunkirk plant. The Chicago & Alton has also placed a smaller order with this interest. The Baldwin Locomotive Co. has booked orders from the Seaboard Air Line and the Georgia railroad.

# AMONG MACHINERY MAKERS.

## PITTSBURG.

### Extension Programs of Large Concerns Involve Vast Expenditures.

Office of THE IRON TRADE REVIEW,
510 Park Building, Nov. 16.

Enormous expenditures for mill extensions in the Pittsburg and other districts continue to be outlined by iron and steel makers. While some of these improvements are still on paper, it is evident that all are approaching closer to the point of obtaining the necessary appropriations and that definite action will be taken soon on those plants which will stand the test of final consideration. The announcement of the Carnegie Steel Co. that it will proceed at once with the construction of merchant mills in the Mahoning valley originally planned three years ago, is representative of the spirit of the hour.

There are a number of other important programs of new construction and capacity extensions under consideration by both independent steel manufacturers and by subsidiary companies of the United States Steel Corporation. In fact it seems that there is scarcely a large interest in the iron and steel industry that has not some extensive plan of enlargement either now on drawings or being actually advanced. Along this line may be cited the actually determined or tentative plans of additional construction by the Carnegie Steel Co., the Jones & Laughlin Steel Co., the Republic Iron & Steel Co., the American Sheet & Tin Plate Co., the Youngstown Sheet & Tube Co., the American Steel & Wire Co., the Bethlehem Steel Co. and many others. Equipment makers are watching with interest the development of these projects since they involve the expenditure of many millions and the consequent heavy demand for machinery of various kinds.

There is a very fair run of business in the ordinary lines of the machinery industry. Operating companies are freer with their replacements and many sales of single machines for this purpose are to be noted.

The Osterberg Tin Plate Co., of Waynesburg, Pa., has been chartered in Pennsylvania with a capitalization of $120,000. This company recently took over the property of the Waynesburg Forge, Sheet & Tin Mills upon which it has made extensive improvements. The plant has been remodeled so that it now consists of four hot and four cold mills and six tinning stacks of large size. The galvanizing department has been abandoned. Operations are to be started Nov. 22, and as the company has booked heavily for first half it begins its activities under very favorable conditions. The directors of the company appearing in the incorporation papers are as follows: I. N. Kuhn, R. L. Hoskins, Robt. R. Hardesty, Ellis B. Baily, H. Osterberg, H. J. Scanlon, Harvey Call, P. D. Hoskinson, R. E. Kent, David R. Huss, James B. Huss, all of Waynesburg, Pa.

The W. R. Beatty Machinery & Equipment Co., Carson street, Pittsburg, is adding considerable equipment to its plant in the way of forging machinery, punches, shears and machine tools.

Considerable equipment will be required for the new warehouse of the Carnegie Steel Co. in this city, the active construction work upon which was inaugurated this week. The inquiries now pending call for five cranes and a number of shears. The award of the cranes will likely be made within the current week. It is expected that the new warehouse will be ready to serve the trade about Jan. 15.

Among the inquiries for heavy equipment now before sellers is that for the charging machines for the new open hearth works of the Jones & Laughlin Steel Co. at Aliquippa, Pa. These will be placed shortly.

The first six months of the current fiscal year of the Westinghouse Machine Co., which ended last month, showed a business volume representing the second largest in the history of the company for a similar period. From present indications, it is confidently expected that the next six months will, however, show a much better result. This is due to the fact that business conditions generally are constantly improving, and also because the company has taken on several new lines of product within the last year, now fully developed, the exploitation of which is greatly enhancing the volume of output. Of the business done by the company in recent months, 40 per cent is represented by these new lines. The revival of the electric railway business from the financial depression is the source of many new orders which the company is now obtaining. One of the chief officials speaking of the prospects, said: "There is every indication that the volume of our business will reach its normal figures again by the beginning of the new year." In this connection, the most gratifying feature is that the improvements in the company's manufacturing facilities and some essential changes in the organization of the plant are greatly contributing toward a very successful and profitable business.

## CINCINNATI.

### Demand for Machine Tools Continues Steady in All Lines.

Office of THE IRON TRADE REVIEW,
First National Bank Bldg., Nov. 16.

There is a continued steady demand for machine tools of all descriptions, although the heavier lines are not so active as the smaller tools called for mainly by the automobile industry. There is an insistent call for deliveries and the shops which are behind on orders are making every effort to increase output but are handicapped by the scarcity of desirable labor. Naturally there is discussion as to the permanency of the demand coming from the automobile manufacturing concerns and the makers of automobile parts, but in this discussion there seems to be but little in the way of evidence that the demand is becoming satisfied. To a large extent the manufacture of automobiles is in the line of pleasure vehicles, but the commercial vehicle proposition has not yet apparently been fully developed and with this enormous field for automobile manufacture still available there is some ground for the belief that the automobile industry will continue to require a considerable number of machine tools. The boiler makers in this center are generally busy; but the call for boilers is not usually in connection with engine equipment. Pork packing establishments and breweries are buying largely from the boiler plants with new installations of tanks and the replacing of old boilers.

The A. Sander Packing Co. is installing a new complete equipment of ice machinery and making a number of extensive repairs.

The Willard Machine Tool Co. is now installed in its new shop at the corner of Third and Madison streets in Covington. The company is at work on its new line of lathes and expects to make deliveries of the first machines about Dec. 1.

The Cincinnati Punch & Shear Co. is fairly busy on special machinery and is just completing a new

and interesting machine designed to punch steel angles, which are to be used in the manufacture of a school desk, providing for an adjustable height of the seat. This machine is so equipped that any number of punches and dies can be used in addition to the special purpose for which it was constructed.

The Triumph Electric Co., which for many years was located at the corner of Baymiller and Hathaway streets, has now moved into its new shop in the factory colony at Oakley. The transfer of machinery and stock, office fixtures, etc., was accomplished with unusual rapidity. It required 100 freight cars, and the entire force of 250 employes was kept busy in making the move.

The Hisey-Wolf Machine Tool Co. reports an excellent demand since the first of the month for portable drills and with this company the November outlook is better than the month's record of October.

The Cincinnati-Bickford Co. reports a steady and satisfactory demand for drills, with the shop busy.

The Oesterlein Machine Tool Co. has enough orders on hand to keep the shop busy for the remainder of this year and part of next year and has arranged for increasing its facilities.

## CLEVELAND.

### Prosperity in All Lines of Machinery Trade—New Clutch Company Formed.

Office of THE IRON TRADE REVIEW, Browning Building, Nov. 16.

Local machine tool makers continue to receive orders with a satisfying steadiness. The demand is not felt in any particular line, but extends through all branches of the trade. The demand for hoisting and conveying machinery is particularly marked and local manufacturers in this line are more than satisfied with the outlook for the coming year.

Foundries and forge shops are working day and night and are falling behind on orders more each week, and automobile builders are clamoring for deliveries on parts.

The Ajax Mfg. Co., manufacturer of forging machinery, advises that it is perfecting two new types of machine for use in forge shops; viz., a hot sawing and burring machine, and reclaiming rolls. This concern further advises that its new type of patent high speed stop motion bulldozer is meeting with the greatest success, and that its shops are filled with orders for the same.

The Parish & Bingham Co., manufacturer of cold pressed steel and metal stampings, advises that it is carrying more orders at the present time than at any other time during the past three years. The company is running two shifts per day, and its capacity is taxed to the limit for the next five to seven months. Among other equipment recently added by this concern is a mechanically operated side roll press, which is probably the heaviest of its type in the United States.

The J. D. Smith Foundry Supply Co. has contracts for erecting brass furnace, aluminum furnace and core ovens for the Packard Motor Car Co., Detroit, and for a large battery of ovens for the Ferro Machine & Foundry Co., Cleveland. This concern is about to install a complete sand blast outfit for the Buick Motor Co., Flint, Mich., and in addition to this, has numerous smaller contracts.

A deal has recently been consummated by the Davis Clutch Co., Cleveland, and the Wooster Machine Co., Wooster, O., amalgamating the two concerns. The Davis company had outgrown its facilities for getting out its orders, and by consolidating with the Wooster company has provided ample facilities for handling orders easily, and expediting shipments. The machine shop and foundry of the Wooster Machine Co. will be equipped with every detail necessary to the production of clutches for gas or gasoline engines, counter or line shafts or special machinery.

The C. O. Bartlett & Snow Co. advises concerning the following recent sales: Conveyors and elevators to the Maryland Steel Co., Steelton, Pa., the National Refining Co., Findlay, O., and the National Tube Co. Pittsburg; conveying machinery, to the Champion Rivet Co., Cleveland, and the National Salt Co., Utica, N. Y.; dryer and other machinery for manufacturing coal briquettes, to the Pacific Coke & Coal Briquetting Co., Seattle; ash handling outfit to the Upson Nut Co., Cleveland.

The Canton Foundry & Machine Co. is running day and night on complete equipments of machinery and dies for metal ceilings, conductor pipe, etc., and on alligator shears. It further advises that it is booked up to its capacity to March, 1910. A recent sale was a large alligator shear to the Jos. Joseph Bros. Co., Chicago Heights, Ill., making the sixth large shear sold to this concern during the past year. The Canton company will ship a large equipment of machinery about the first of the year to Vancouver, B. C. It has recently installed a large Niles-Bement-Pond planer in its machine shop.

The Toledo Motor Car Co. has just about completed a new three story shop building 400 feet long and 90 feet wide, and has two other additions on which contracts have been let.

The Acme Boiler & Construction Co., Canal Dover, O. has been awarded the contract for six pontoons for use by the Mississippi River Commission in laying pipe lines at Memphis, Tenn. This company's shop is running at full capacity and a night shift will be instituted about Dec. 1.

## BUFFALO.

### Special Machinery in Demand—Foundry Enterprises Projected.

Office of THE IRON TRADE REVIEW, 932 Ellicott Square, Nov. 16.

Machinery makers are busy and satisfied with the number of specifications coming out, but special machinery still leads and shops are hard pressed to meet the requirements and deliveries asked by their customers. Foundries are doing better business. Plans are under consideration for several large foundry enterprises and these now appear likely to materialize soon. Several such matters are now pending in Buffalo.

Brennan Motor & Mfg. Co., Syracuse, N. Y., manufacturers marine gas engines, etc., has decided to extend its present facilities and will build a 30 x 100 two-story factory on Grape street. Specifications are ready for bids.

A company is now being organized which will build an extensive woodworking plant at Welland, Ont., near the Niagara Frontier, and five acres of land have been purchased for a site. Robert Stewart, Jr., of the Robert Stewart Co., Ltd., Guelph, Ont., associated with several American capitalists, is guiding the plans. Work on construction will begin at once. There will be considerable woodworking machinery required which has not been purchased as yet.

It is understood that the Niagara, St. Catherines & Toronto Railway Co., will construct a rotary transformer station with an output of 500

kilowatt. It will be built at St. Catherines, Ont.

George F. Wells has been appointed general manager of the Buffalo & Southern Railway Co., with offices at Buffalo, N. Y. The company has extensive building and equipment matters under way and is likely to be in the market for steel rails, rolling stock and machinery. Mr. Wells has been actively connected with the company since its organization.

The J. P. Devine Co. of Buffalo, which manufactures extensively vacuum drying apparatus for electric coils, cables, transformers and armatures and vacuum pumps for drying and impregnating, has issued recently several folders and catalogs showing its latest devices.

The H. R. McNeil Co. of Niagara Falls, N. Y., will build a manufacturing plant for making stave jointing machinery and cooperage stock. Specifications are not out.

The Lackawanna Traction Co. has let a contract for building a freight terminal at Buffalo to cost $14,500.

A casing mill 51 x 300 to cost about $40,000 will be erected at once at North Tonawanda, N. Y., by the American District Steam Co. Machinery equipment will be required.

The H. E. Nutts Mfg. Co., Syracuse, maker of foundry supplies, will build a three story factory 65 x 140 on Milton avenue, Syracuse. Work will be commenced immediately.

## NEW YORK.

### An Active Market has Lead to Price Advances in Some Lines.

Office of THE IRON TRADE REVIEW, Room 1005, No. 90 West St., Nov. 16.

The local machine tool trade is in an exceedingly active state, manufacturers and dealers generally reporting conditions as thoroughly satisfactory and trade as well distributed among practically all lines, though milling machines, automatic screw machines, lathes and metal saws apparently are leading the staple machines. Deliveries on milling machines run from three to six months and one sale closed during the past week for a well known make called for shipment eleven months ahead. A few scattered price advances are coming out all the while, one large maker of drill presses having just announced the schedule for its 1910 models on a level about 10 per cent higher than the present. Key seaters are higher and one milling machine interest has now made two advances and one price readjustment, bringing its present price level about 20 per cent above that prevailing through the depression. There is evidently an increasing disposition to bring out new machines and re-designed models, which is one of the strongest indications of renewed activities, as there has been very little of this since activities slackened up in 1907; an eastern drill press manufacturer has re-designed every model produced at its plant. A brisk demand for cold metal saws is reported, inquiries coming from various parts of the country and export sales being fairly numerous.

A gratifying feature of the market is its large volume of business in the absence of heavy buying by any one interest or class of interests. Practically the only important inquiry before the local trade is that of the International Steam Pump Co., which last week solicited prices on additional equipment and is buying for its various plants.

A great deal of buying is being done by the iron and steel manufacturing plants of the east which are increasing their capacity by important additions. The bulk of their buying naturally is of special machinery and equipment, but in some instances a limited number of machine tools are involved. The latest announcement of contemplated extensions is that of the American Iron & Steel Mfg. Co., Lebanon, Pa., which will spend about $500,000 on a new billet mill to operate on steel produced by the electric process. The Phoenix Iron Co. has just completed a 100-ton open hearth steel furnace at its Phoenixville, Pa., works, and at Pottsville the Eastern Steel Co. has broken ground for new open hearth capacity and other improvements. A number of machine tools are being purchased by the Bethlehem Steel Co., South Bethlehem, Pa., in connection with the enlargement of that plant; these are of heavy type and include an extremely large planer. The improvements at the Sparrows Point plant of the Maryland Steel Co. are well under way and minor additions are being made to a number of other eastern iron and steel works. The Carpenter Steel Co., Reading, Pa., recently completed plans for a large warehouse.

In order to care for accumulated orders, the Pennsylvania Shafting Co., Spring City, Pa., has found it necessary to build a small addition to its plant.

The Russell & Erwin Mfg. Co., New Britain, Conn., has had plans prepared for a brick building, 60 x 100 feet, and seven stories in height. One story will be devoted to additional office requirements and the remainder of the building to manufacturing purposes.

An addition is contemplated to the plant of S. B. Sexton Stove & Mfg. Co., Baltimore, Md., for which additional space adjacent to the present plant has been secured.

Contractors are watching with interest for the advertisement of the distribution reservoir for the new Catskill water system, which will be located within the city limits of Yonkers. It will have a daily capacity of 900,000,000 gallons and will probably cost in the neighborhood of $12,000,000. Contracts have been completed and bids will be called for in the early future. The official awards will be followed by considerable purchasing of contractors' equipment.

Dec. 1 is the date set for awards on five additional barge canal contracts, involving an aggregate of about $2,387,000, by the state superintendent of public works. These, with the estimate of the state engineer, are as follows: dredging a channel in the Hudson river at the mouth of the canal, $1,439,933; constructing a lock at Fort Edward, $232,908; constructing a lock in the Hudson river below Mechanicsville, $270,675; completing two locks at Waterford, $372,000; providing winches for movable dams, $72,000. The award of these contracts will place over $40,000,000 worth of work on the barge canal project under way. Both the canal route and the Ashokan reservoir site have proven extremely comfortable markets for contractors' equipment, industrial cars, steel rope and allied products.

## SOLID STEEL CASTING SALE.

The plant of the Solid Steel Casting Co., Chester, Pa., has been sold by the receiver, William B. Harvey, to Thomas Ridgeway, of Philadelphia, who is understood to represent interests holding a mortgage on the property. The consideration was $100, but the property carries a mortgage of about $100,000 and accumulated interest and taxes. The plant has been idle for several months during the receivership, but will probably be put in operation soon. Its equipment includes two 20-gross ton acid open-hearth furnaces and a specialty has been made of locomotive and machinery castings.

Kalamazoo, Mich., foundrymen with only two exceptions, have granted their molders the nine-hour day and $2.75 minimum, and the men have returned to work.

## OUR FOREIGN COMMERCE

### Exports Decrease, but Still Favorable —Close Approach to Record— Great Increase in Scrap Imports.

Iron and steel exports in September show a decrease of about 8,000 tons from August. There were decreases as follows: Pig iron, 3,000 tons; rails, 3,000 tons; wire, 3,000 tons; pipes and fittings, 2,000 tons; nails and spikes, 1,000 tons. These were partially offset by increases of 1,000 tons each in unfinished steel and sheets and plates. Steel bars, in which line the pressure upon domestic mills has been the greatest, showed a gain of about 500 tons over August, and indeed the exports of steel bars have been materially larger in the third quarter than in the first half of the year. The average steel bar exports in the first half of this year were 5,320 tons per month, while since the middle of the year they have been as follows: July, 6,691 tons; August, 6,111 tons; September, 6,651 tons.

The year as a whole is showing an excellent gain over 1908, as shown by the following total tonnage figures:

| NINE MONTHS, ENDING SEPTEMBER. | |
|---|---|
| 1909 | 878,670 |
| 1908 | 729 685 |
| Nine months gain | 148,985 |

Assuming the last three months of the year to show a rate similar to the September rate, the forecast for exports for the calendar year will compare as follows with previous years, 1906 and 1907 having been the two highest on record:

| Calendar years, | Gross tons. |
|---|---|
| 1906 | 1,325,740 |
| 1907 | 1,301,979 |
| 1908 | 964,266 |
| 1909* | 1,170,000 |

*Estimated.

In the following table, the monthly exports are given since the beginning of 1907. It will be observed that while September exports fell below the five preceding months in the year, they exceeded the exports in any month of last year.

TOTAL IRON AND STEEL EXPORTS, GROSS TONS.

| | 1907. | 1908. | 1909. |
|---|---|---|---|
| January | 102,630 | 74,353 | 70,089 |
| February | 64,728 | 81,773 | 84,860 |
| March | 112,787 | 96,681 | 94,522 |
| April | 132,792 | 93,285 | 100,903 |
| May | 91,543 | 64,020 | 109,977 |
| June | 92 996 | 69,779 | 114,721 |
| July | 122 249 | 86,806 | 100,670 |
| August | 118,792 | 86,244 | 105,694 |
| September | 114,819 | 76,727 | 97,387 |
| October | 123,170 | 85,668 | ..... |
| November | 116,308 | 71,028 | ..... |
| December | 86,019 | 77,636 | ..... |
| Total | 1,301,979 | 964,266 | 878,670 |

The gain of 148,985 tons in the first nine months of this year, compared with the corresponding period in 1908 is well distributed through the different items, with two notable exceptions, in which decreases are shown. Structural iron and steel fell from 91,448 tons to 68,433 tons, a loss of 23,000 tons, while tin plates fell from 11,401 tons to 6,825 tons, the loss being large in percentage, though not large in actual tonnage. Sheets and plates showed the most noteworthy gain, from 75,722 tons to 124,826 tons, nearly 50,000 tons, or about 65 per cent.

Rails have not made a very good export showing. As may be observed, our total exports this year promise to fall only 10 or 12 per cent short of the total in the two best years we have had for exports, 1906 and 1907. Rail exports, however, make only the following showing:

| | Nine months, ended September. |
|---|---|
| 1906 | 250,278 |
| 1907 | 253,249 |
| 1908 | 156,098 |
| 1909 | 189,784 |

Thus, where total exports are falling off only between 10 and 12 per cent from the two high years, rails show a decrease of about 25 per cent. The deficiency is made up in other ways, and chiefly in more finished products. In view of the fact that our exports this year are falling only slightly behind those in the record year of 1906, it is quite interesting to compare the distribution. Comparing, then, the nine months ending September, 1906, with the similar period this year, we find the following decreases:

| | |
|---|---|
| Pig iron | 20,000 |
| Unfinished steel | 76,000 |
| Rails | 40,000 |
| Structural | 16,000 |
| Bar iron | 32,000 |
| Tin plates | 4,000 |
| Wire | 17,000 |
| Wire nails | 17,000 |

Against the above are the following increases:

| | |
|---|---|
| Scrap | 14,000 |
| Wire rods | 5,000 |
| Steel bars | 29,000 |
| Sheets and plates | 46,000 |
| Tacks, etc. | 2,000 |
| Pipes and fittings | 2,000 |

### Value of All Exports.

The foregoing statistics refer, of course, only to our exports of iron and steel in tonnage lines. As shown by the exhaustive summary given with the review of our August commerce, in the issue of Oct. 28, the value of our tonnage exports has averaged less than one-third the value of all iron and steel exports, the non-tonnage lines thus comprising more than two-thirds of the grand total, consisting of hardware, machinery, etc. The value of all iron and steel exports, including the tonnage lines, but not including iron ore or agricultural implements, amounted in September to $12,966,908. The average value per month in the preceding eight months of the year was $12,619,244, so that a slight gain over the preceding months is shown by September.

### Tonnage Imports.

Our iron and steel imports continue of relatively negligible proportions, although gains are shown. September showed imports of 32,165 tons, against 22,120 tons in August and 12,950 tons in September, 1908. Possibly the most important feature was the increase in scrap exports. In the seven months ending with July, scrap imports averaged only 322 tons per month. In August they rose to 2,125 tons, and in September to 9,886 tons, so that September imports were 30 times the average imports in the seven months preceding the new tariff law. However, it does not necessarily follow that the larger imports will be continued, as some importers seem to have misunderstood the new law and have brought in material which the customs authorities do not classify as scrap after all. We presume, of course, that while some material has been excluded from the scrap classification, when levying the duty, the material is included as "scrap" in the statistical table. We do not find any large amount of material in any other classification in the government figures.

IRON AND STEEL EXPORTS, GROSS TONS.

| | September, 1908. | September, 1909. | Nine months, ending September, 1908. | Nine months, ending September, 1909. |
|---|---|---|---|---|
| Scrap | 2,654 | 1,491 | 17,091 | 23,541 |
| Pig iron | 4,116 | 2,862 | 30,569 | 40,667 |
| Billets, sheets, bars, etc. | 7,300 | 10,475 | 86,315 | 94,594 |
| Wire rods | 559 | 972 | 4,463 | 10,671 |
| Rails | 17,311 | 23,478 | 156,098 | 189,784 |
| Structural iron and steel | 9,538 | 7,473 | 91,448 | 68,433 |
| Bar iron | 890 | 734 | 5,691 | 9,672 |
| Steel bars | 3,922 | 6,651 | 32,561 | 51,373 |
| Sheets and plates | 8,561 | 17,090 | 75,722 | 124,826 |
| Tin plates | 69 | 610 | 11,401 | 6,825 |
| Hoop, band and scroll | 309 | 249 | 3,458 | 2,294 |
| Wire | 9,465 | 7,976 | 99,546 | 109,194 |
| Wire nails and spikes | 1,862 | 2,185 | 20,292 | 21,124 |
| Cut nails and spikes | 241 | 772 | 5,533 | 6,880 |
| All other, including tacks | 427 | 538 | 3,536 | 5,837 |
| Pipes and fittings | 9,408 | 13,831 | 85,962 | 112,955 |
| Totals | 76,732 | 97,387 | 729,685 | 878,670 |

IRON AND STEEL IMPORTS, GROSS TONS.

| | September, 1908. | September, 1909. | Nine months, ending September, 1908. | Nine months, ending September, 1909. |
|---|---|---|---|---|
| Scrap | 404 | 9,886 | 3,666 | 14,263 |
| Pig iron | 8,339 | 12 601 | 65,280 | 99,823 |
| Bilets, bars and steel, n. e. s. | 584 | 1,434 | 7,194 | 11,853 |
| Wire rods | 774 | 941 | 8,570 | 8,548 |
| Rails | 30 | 157 | 1,124 | 539 |
| Structural | 313 | 650 | 1,785 | 4,364 |
| Bar iron | 718 | 1,718 | 15,034 | 11,662 |
| Sheets and plates | 261 | 432 | 1,785 | 2,657 |
| Tin plates | 1,527 | 4,346 | 49,712 | 44 388 |
| Totals | 12,950 | 32,165 | 154,150 | 198,297 |

## WORLD'S RECORD

### Claimed for Canadian Rod Mill's October Output.

The Dominion Iron & Steel Co.'s output during October was a heavy one, especially that of the rod mill, which amounted to 8,569 tons. It is claimed that this is a new world's record, being 35 per cent in excess of the previous record for a continuous mill. The October outputs of the Nova Scotia Steel & Coal Co. were: Steel, 7,148 tons; pig iron, 5,640; coal, 77,130 tons. The Dominion Coal Co.'s output for October amounted to 205,215 tons of coal, showing a substantial gain over September. The production for October, 1908, was 262,000 tons.

The car company merger is now formally complete, a charter of incorporation having been secured under the title of the Canadian Car & Foundry Co., with an authorized capital of $12,500,000.

The Hamilton (Ont.) Steel & Iron Works has increased its quarterly dividend from 1 per cent to 1½ per cent, making the yearly rate 6 per cent.

The Cockshutt Plow Co., of Brantford, Ont., having acquired a large interest in the Frost & Wood Implement Co., of Smith's Falls, Ont., Harry Cockshutt, of the former company becomes vice president of the Frost & Wood Co. An arrangement has been arrived at by which the latter concern which manufactures harvesting machinery and threshers is to withdraw its organization from the northwest. The Cockshutt Co. agrees to purchase all its harvesting stock from the Frost & Wood Co., handling it in the northwest through its own agents.

## CONTRACTS FOR PUMPS.

Toronto, Can., Nov. 15.

Contracts have been awarded by the city for electrical pumps for the water works as follows: Jens-Orten-Boving, London, Eng., four pumps with capacity of 13,500,000 gallons each, $14.800, and four pumps of capacity of 16,000,000 gallons each, $6,500; Caledonia Iron Works, Montreal, two pumps with capacity of 5,000,000 each, $11,703, and four pumps with capacity of 6,500,000 each, $7,385; Canadian General Electric Co., of Toronto, four pumps of capacity of 1,500,000 gallons each, $4,822. The cost of these pumps was originally estimated at a total of $150,000, but according to the tenders accepted it will be only a little over $45,000. There were very wide differences between the tenders offered, some of the bids being from three to four times as high as those accepted.

## PRIME STEEL CO. ABSORBS THE DUTCHER STEEL CASTING CO.

Announcement is made that the plant and business of the Dutcher Steel Casting Co., of Milwaukee, Wis., manufacturer of open-hearth steel castings, has been purchased and absorbed by the Prime Steel Co., of the same city. The latter concern heretofore has made a specialty of crucible steel castings, and this absorption is therefore in the line of progress and expansion. All the Goodrich and Dutcher interests have retired from the management of the company. The old name has been abolished and the plant hereafter will be known as the Dutcher plant of the Prime Steel Co. All contracts made by the Dutcher Steel Casting Co. will be assumed by the new proprietors. Large and expensive improvements in equipment and practice at the Dutcher plant will be made.

The officers of the Prime Steel Co. are as follows: O. L. Prime, president; D. W. Prime, first vice president; J. H. Tobin, second vice president; C. J. Wilde, secretary and treasurer; Frank Matchell, assistant secretary and treasurer.

## WILL INSTALL BY-PRODUCT PLANT AT SOO.

General Manager W. C. Franz, of the Lake Superior Corporation, of Sault Ste. Marie, Ont., states that a contract for a coke oven plant to cost $200,000 is being made with the Koppers Coke Oven Co., a representative of which is now at the Sault. The plant will be located adjoining the steel mill on the northwest side and will be operated in connection with the steel plant, as in the Illinois Steel Co.'s works. A pile driver has already been put to work on the site.

## WILL ERECT NEW STOVE.

The Perry Iron Co., Erie, Pa., has the foundations installed and will erect immediately, a new stove, which will be in addition to the present equipment of 21 x 70-foot McClure stoves. This new stove will be of the new type with square checkers as recently patented by A. C. Nelson, and is being erected under contract by Arthur G. McKee, engineer, Cleveland.

## GROWING SHARE OF MANUFACTURING INTERESTS IN INTERNATIONAL TRADE.

Three-fourths of the commerce of the United States is conducted for and on behalf of the manufacturing industries. Manufactures and manufacturers' materials when combined formed in the fiscal year 1909 74.14 per cent of the imports and 72.78 per cent of the exports; while foodstuffs and miscellaneous materials formed but 25.86 per cent of the imports and 27.22 per cent of the exports. This statement is based upon the classification of imports and exports made by the Bureau of Statistics of the Department of Commerce and Labor.

An examination of the relation of the imports and exports to the manufacturing industries at various periods during the history of the country, and especially in recent years, shows a rapid change in the character of the foreign commerce of the United States. Ten years ago, in 1899, the share which manufactures and manufacturers' materials formed of the imports was but 67.42 per cent instead of 74.14 per cent, as in 1909; 20 years ago, but 65.90 per cent, and 30 years ago, in 1879, these groups of manufactures and manufacturers' materials formed but 56.79 per cent of the total imports. On the export side manufactures and manufacturers' materials formed, ten years ago, but 54.66 per cent of the total, instead of 72.78 per cent as at present; 20 years ago, 61.91 per cent, and 30 years ago, but 47.55 per cent of the total imports.

## WILL NOT RESUME.

The Virginia Iron, Coal & Coke Co. has officially made the statement that, contrary to report, it has no intention of resuming operation of its furnace and rolling mill at Bristol, Va., at this time.

The October output of the Lake Superior copper mines was 19,632,394 pounds, compared with 20,117,917 pounds in September. The Lake Superior mines have produced since the first of the year 197,170,911 pounds, compared with 188,030,129 pounds for the same 10 months last year.

The Great Lakes Engineering Co., Detroit, has filed notice of increase of its capital stock from $1,500,000 to $2,500,000.

Wharton, N. J., No. 1 stack was lighted Oct. 25 after two years' idleness.

# A NOVEL LOCOMOTIVE PILE DRIVER[1]

WALTER FERRIS.[2]

The machine described in this paper is of some engineering interest as the most substantial and complete railway pile driver yet produced. Its special claims to consideration as a new development in mechanical engineering, however, lie in the unusual arrangement and strength of the self-propelling mechanism, and in the self-contained hydraulic turntable, whereby the entire machine, including trucks, is quickly lifted clear of the rails and turned end for end. The propelling engines, mounted on the car body and delivering more than 250 horsepower, are connected to the axles of ordinary bogie trucks without interfering with the movements of the trucks in turning curves, passing over frogs, and the like.

The machine was designed by the Bucyrus Co., South Milwaukee, to meet the requirement of the Atchison, Topeka & Santa Fe railway system, for a pile driver capable of climbing any grade on its line and hauling its own cars of piles, tools, etc. The self-propelling pile drivers built hitherto are capable of moving themselves for short distances while at work, but from lack of sufficient steam capacity as well as engine power must have a locomotive in constant attendance. The services of this locomotive are usually charged against the bridge department of a railway at the rate of from $20 to $30 per day. After having used several of the ordinary self-propelling machines, A. F. Robinson, bridge engineer of the Santa Fe system, prepared specifications calling for a pile driver of much higher propelling power. This resulted in the designing by the Bucyrus Co. of the machine herein described, which has been in active service on the Santa Fe lines since January, 1909.

The general appearance of the machine is shown in the illustrations. Fig. 1 shows the machine standing on its hydraulic turntable with all wheels in the air. In this position and without any blocking the pile was picked up, put in place in the leaders and driven at a distance of 32 feet from the center of the track. It was not desirable to drive this pile all the way in and the leaders were therefore backed down to clear the partially driven pile. The principal use of the hydraulic turntable, which will be described later on, is to turn the machine end for end when there is no railway turntable or "Y" available.

Fig. 2 shows the leaders up ready for driving with the swinging frame turned across the track, and also shows how the counterweight on the opposite side of the swinging frame balances the weight of the leaders, keeping the machine always in a stable condition. In this position a pile can be driven 19 feet from the center of the track.

Fig. 3 shows the machine with leaders folded in shipping position.

Fig. 4 shows the general arrangement of machinery. The car is 40 feet long, built entirely of structural steel and steel castings. On the front end is mounted the swinging frame, shown in Figs. 1, 2 and 3, consisting of a pair of parallel trusses supporting the leaders at one end and a counterweight at the other end with the necessary parts for raising and lowering the leaders and swinging the entire frame to the right or left at right angles to the car body. This frame is swung by a large worm

[1]From the November proceedings of the A. S. M. E.
[2]South Milwaukee, Wis.

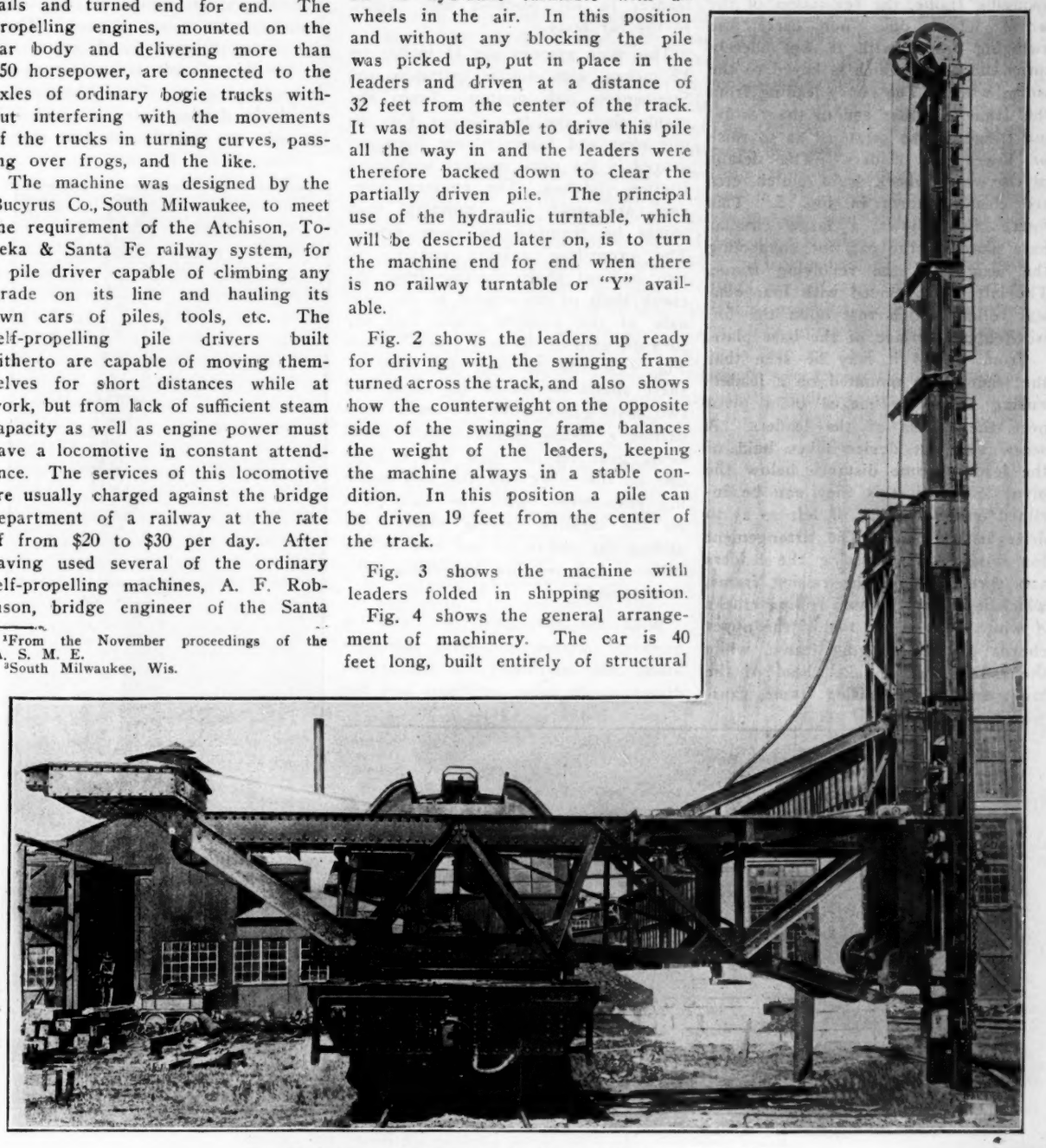


FIG. 1—SHOWING MACHINE STANDING ON HYDRAULIC TURNTABLE.

wheel, which also serves to raise and lower the leaders. The latter operations are accomplished by means of the long worm-wheel hub projecting upward through the center pintle upon which the swinging frame revolves, a double-grooved sheave or drum being keyed to the upper end of the worm-wheel hub. This drum is provided with a clutch by which it can be engaged with the main base plate of the revolving frame. When this clutch engages with the swinging frame the latter moves with the worm wheel. When the clutch is out of engagement, however, and a brake is applied between the car body and the swinging frame, the revolution of the worm wheel does not carry the swinging frame with it, but merely turns the drum, which is keyed to the worm wheel. The ropes leading from the drum to either end of the revolving frame are so arranged as to raise or lower the leaders. The details of the worm wheel, drum, clutch, etc., are clearly shown in Fig. 5. This figure also shows a large circular base plate on the car, for supporting the weight of the revolving frame. The latter is provided with four conical rollers which rest upon the finished upper surface of the base plate.

From Fig. 4 it may be seen that the leaders are mounted on a leader-raising frame by means of a pivot near the center of the leaders. A screw and nut device takes hold of the leaders some distance below the pivot and with this they can be inclined either to right or left so as to drive batter piles. The arrangement for raising and lowering the leaders acts directly upon the raising frame, which is carried by two rolling trucks *A* which roll on the top of the upper chords of the swinging frame, while the radius arm *B* takes hold of the lower end of the raising frame, causing it to move in the arc of a circle as indicated. The ropes *C* and *D* over the drum pass around suitable idler sheaves and are anchored to the sliding crosshead *E* forming a closed circuit. From this crosshead the raising arms *F* take hold of the raising frame, transmitting the movement of the crosshead to the latter. The hammer-hoist rope, pile-hoist rope and steam pipe (the last-named is not shown) run up from the car body to the swinging frame through the large hollow hub of the swinging worm wheel. The steam pipe is on the center and the ropes are so close on either side that they work equally well with the leaders in any position with regard to the car body.

The main engines are 11 inches by 12 inches, with double cylinders and Stephenson link motion. From the crank shaft the two drums for the pile-hoist and hammer-hoist lines are geared in the usual manner with cone friction clutches. The engines, however, are much more powerful than would be required for these drums. The propelling gearing consists of two inclined shafts leading from the crank shaft of the engine to the rear axle of the forward truck and the forward axle of the rear truck. From Fig. 4 it will be seen that each of these shafts carries on its upper end two bevel gears, while the crank shaft carries a sliding sleeve with a small bevel gear on one end and a large one on the other end, the two meshing respectively with the two pairs on the inclined driving shafts. By sliding the sleeve to one end or the other a fast or slow propelling ratio is obtained.

With the fast gear, on level or moderate grades and with moderate loads, the machine can readily be driven at 25 miles per hour and has been driven at 30 miles per hour. With the slow gear the engines are powerful enough to slip the two driving axles and thus obtain all the tractive force that can be had with about 80,000 pounds weight on drivers. The machine can thus be used effectively as a switching engine and will readily haul its own weight with considerable additional load over grades of 1½ per cent or more. The acceptance-test of the first machine built was a run of 32 miles up a grade averaging 75 feet to the mile, with a maximum of 97 feet to the mile.

The lower ends of the inclined propelling shafts shown in Fig. 4 are provided with bevel pinions. These pinions mesh with bevel gears cast in one piece with large sleeves, as shown in Fig. 6. These sleeves surround the driving axles, a cored hole through the middle of the sleeves

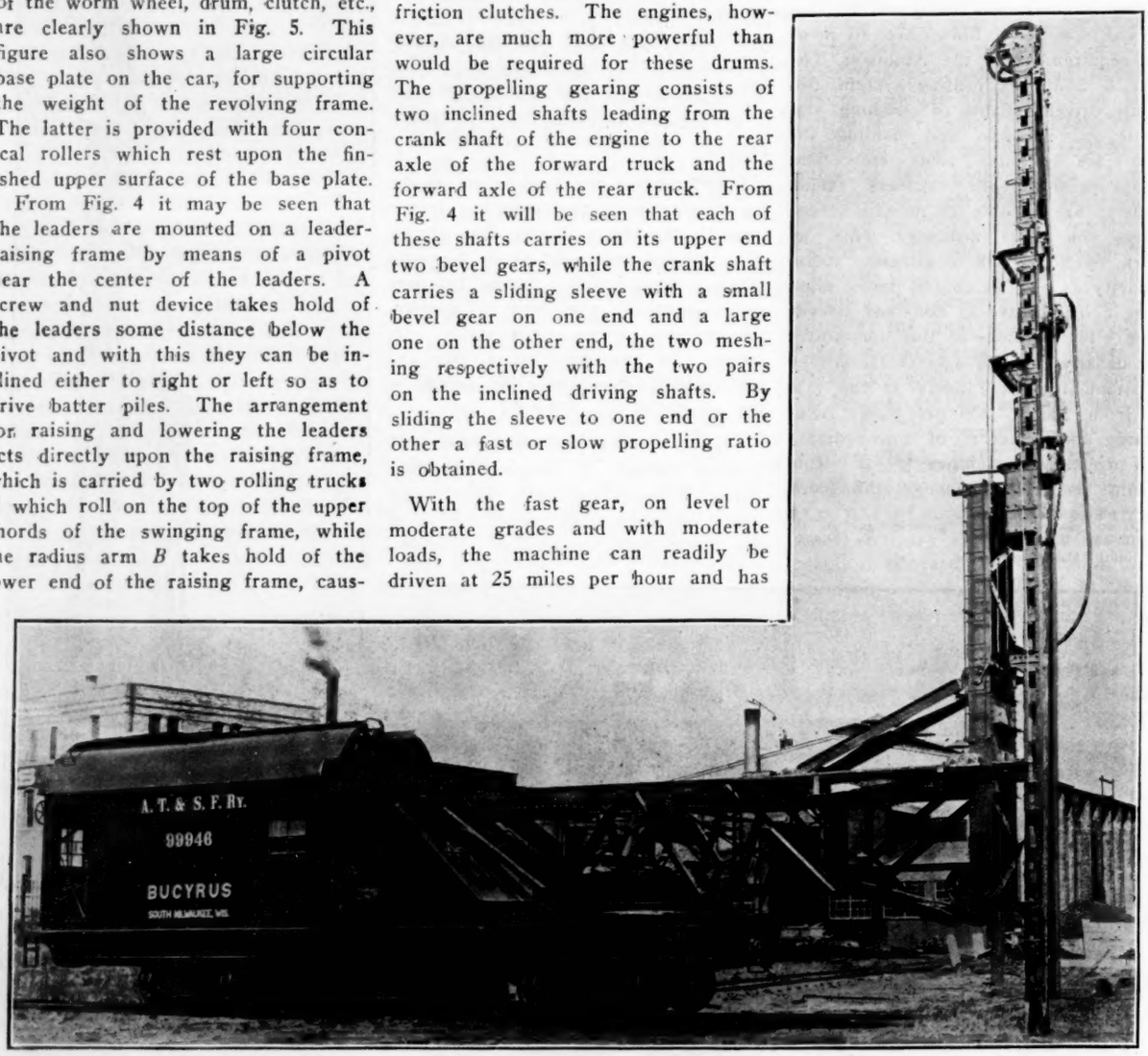



Fig. 2—Showing Machine With Leaders Up Ready for Driving.

10 inches in diameter providing about 2 inches clearance around the axles. The sleeves are supported by brackets rigidly attached to the car body with babbitted bearings. All this gearing is fastened to the car body only and remains in line without regard to the swiveling of the trucks. The connection by which the driving torque is communicated from the propelling sleeves to the axles is also shown in Fig. 6. It consists of a modified type of universal joint so arranged that there is nothing to interfere with the axle passing through the middle. The propelling sleeve carries at one end a large flange with lugs supporting two pins *G*; these pins engaging with two bronze bushed lugs *H* formed on the inner side of the toggle casting *i*. On its outer side it carries another pair of lugs *J* on an axis at right angles to the axis of the pins *G* and these lugs *J* are connected to a U-shaped driving yoke *K*. The open end of this yoke is again pin-connected to a bracket *L* which is keyed to the axle. Both pins, *G* and *M*, are made much longer than the lugs which engage them, to permit end play due to the displacements of the axle, as shown on the plan view in Fig. 6. As these two pin axes are at right angles to each other their combined slip will take care of any movement of translation, while the combined revolution of the parts around the pins *G*, *M* and *N* provides for any possible twisting. The wearing parts involved are six steel pins and six bronze bushings, all of the same size, and all parts are so made that the wearing surfaces can be replaced without taking the truck from under the machine. The pins are made hollow and are packed for continuous lubrication. The method of detaching the driving gears when it is desirable to ship the pile driver in a freight train is slightly indicated in Fig. 4, the rear axle of the front truck, where an operating lever is shown taking hold of the bearing which supports the bevel pinion at the lower end of the forward driving shaft. This bearing and the pinion are mounted in a sliding support, which enables the pinion to be drawn out of mesh with the bevel gear, permitting the propelling sleeves and gears shown in Fig. 6 to revolve freely with no gears in mesh. The same arrangement is provided on the rear truck.

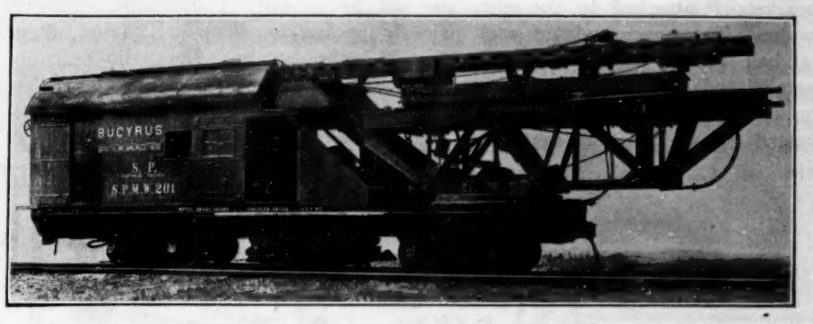



FIG. 3—SHOWING MACHINE WITH LEADERS FOLDED IN SHIPPING POSITION.

In order to provide the necessary steam capacity for these propelling requirements, the boiler required is nearly three times the size of those ordinarily furnished for pile drivers. The boiler is of the locomotive type, 54 inches in diameter, 15 feet 9 inches long, having about 800 square feet of heating surface and designed for 175 pounds pressure. This pressure is required only for steam economy on propelling runs, as the engines are so large that all the ordinary movements of the machine can be made with 100 pounds pressure.

One of the striking features of the machine is the hydraulic turntable, which is shown in action in Fig. 1, and in shipping position in Fig. 3. It is frequently very important that a pile driver should be able to turn end for end or else to work at either end indifferently. The latter plan requires that the boiler and pile-driving machinery shall all be mounted upon a swinging deck, which can be turned through a full circle and reach either end of the car. This plan has been thoroughly tried and is satisfactory as far as pile driving is concerned, but makes it impossible to get a sufficiently powerful and reliable propeling gear between the engines and the trucks. In the new machine, therefore, the pile-driving apparatus is mounted on the car body where it can work at one end only, thus obtaining the powerful propelling drive already described. To reverse the machine the hydraulic lifting jack shown in Fig. 7 is attached underneath the car and under the center of gravity of the entire structure. This jack consists of two ball-race castings having races about 5 feet in diameter provided with 2-inch steel balls. The upper ball race is carried upon a set of four bell cranks or levers *O*, two on each side of the car, the bell cranks being pivoted upon

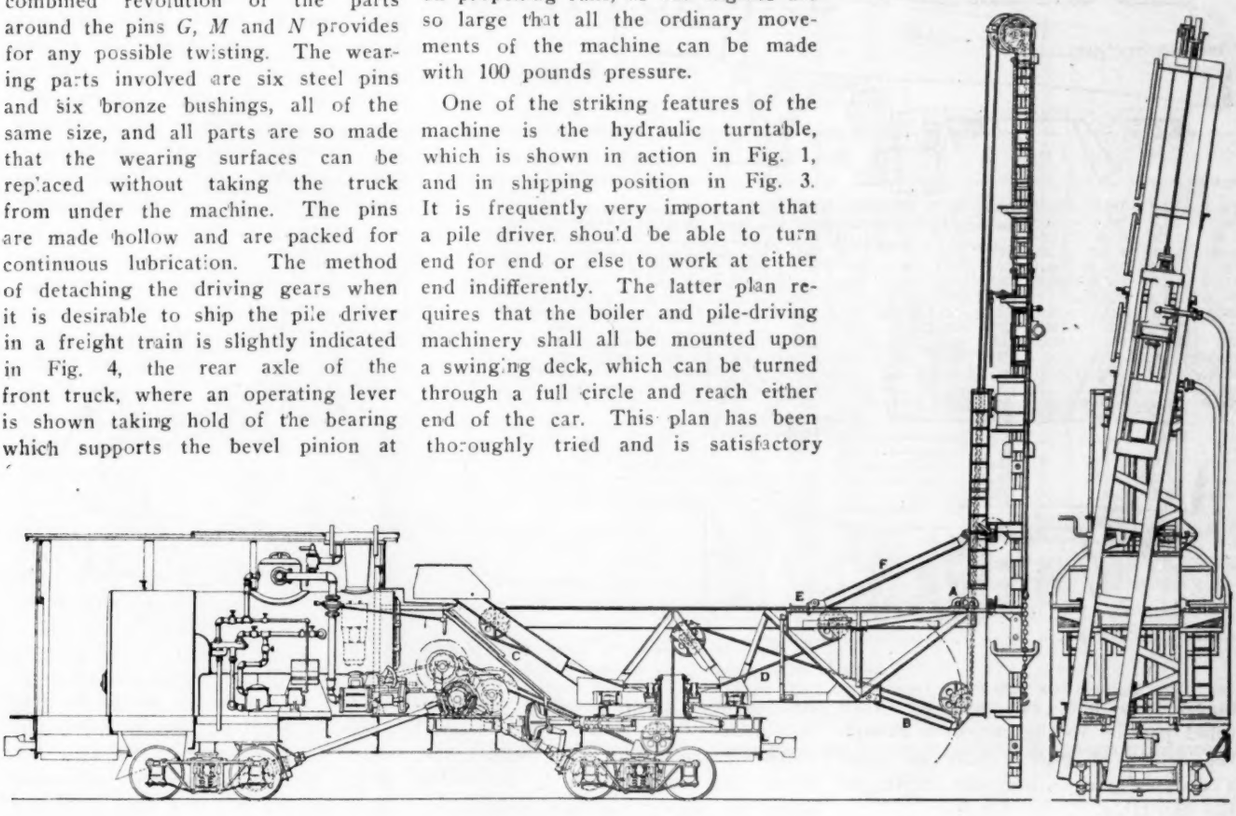



FIG. 4—SIDE AND FRONT ELEVATIONS OF BUCYRUS LOCOMOTIVE PILE DRIVER.

brackets *P* attached to the main car beams. The upper ends of each pair of bell cranks are connected by a parallel rod, while the rear bell cranks on the two sides of the car are connected across by a heavy shaft *Q*. ed by a pair of hydraulic cylinders 12 inches in diameter, having about 28 inches stroke. One cylinder is located on each side of the car. The cylinders have trunk pistons with sufficient area between the outside of chair castings which rest on the rails and can readily be placed under the four jack screws, which are located in the four corners of the lower ball race. The lower ball race also carries a circular rack, while the upper

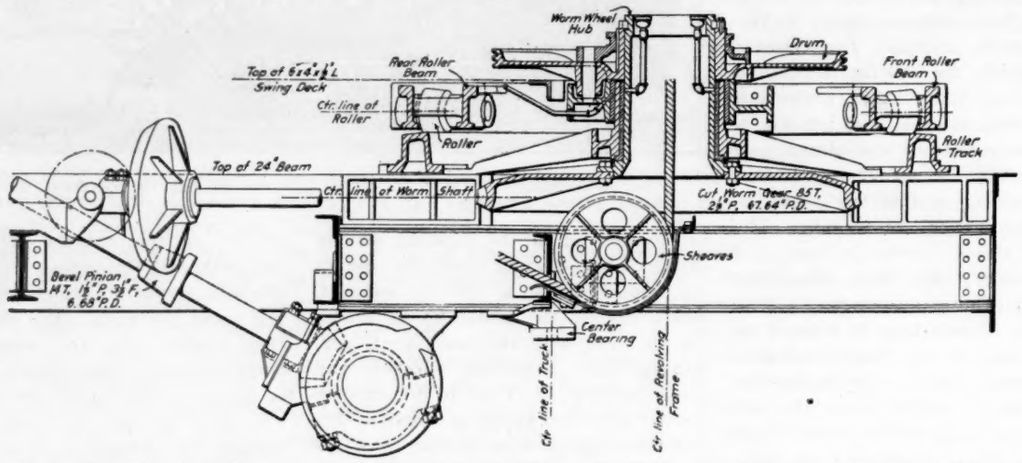



FIG. 5—PLAN AND SECTIONAL ELEVATION OF SWINGING AND PROPELLING MECHANISM OF THE LOCOMOTIVE PILE DRIVER.

This arrangement compels all four bell cranks to act in unison, and when they are operated by the hydraulic cylinders the four pins from which the upper ball race is suspended move up and down the same distance, maintaining the turntable at all times parallel to the car, even though the center of gravity may be quite a distance away from the center of the turntable.

The system of bell cranks is operated by a pair of hydraulic cylinders 12 inches in diameter, having about 28 inches stroke. One cylinder is located on each side of the car. The cylinders have trunk pistons with sufficient area between the outside of the trunk and the bore of the cylinder to provide lifting force enough to raise the turntable away from the track and put it in shipping position. While lifting the car the pressure acts upon the full area of the 12-inch piston. The working pressure of about 200 pounds per square inch is provided by the boiler feed pump. The lower ball race, which is suspended from the upper ball race by suitable clips, is also provided with a set of ball race has a transverse shaft with a crank on each end and a double gear reduction to a swinging pinion which meshes with the rack on the lower ball race. When the machine is to be turned it is necessary only to put the chair castings "*s*," shown in Fig. 7, under the jack screws and run the latter until they touch the chairs. The entire car is then raised by pumping water into the hydraulic cylinders and turned end for end by hand, two men working on each crank. In a high wind three men may be required on each crank. The entire turning operation occupies from 10 to 15 minutes. An important incidental advantage of the turntable has already been touched upon. Fig. 1 and Fig. 2 show its use to enable the driver to reach a pile at a long distance from the center of the track. In this way, should occasion arise, any point within 32 feet of the track may be reached and the pile driven.

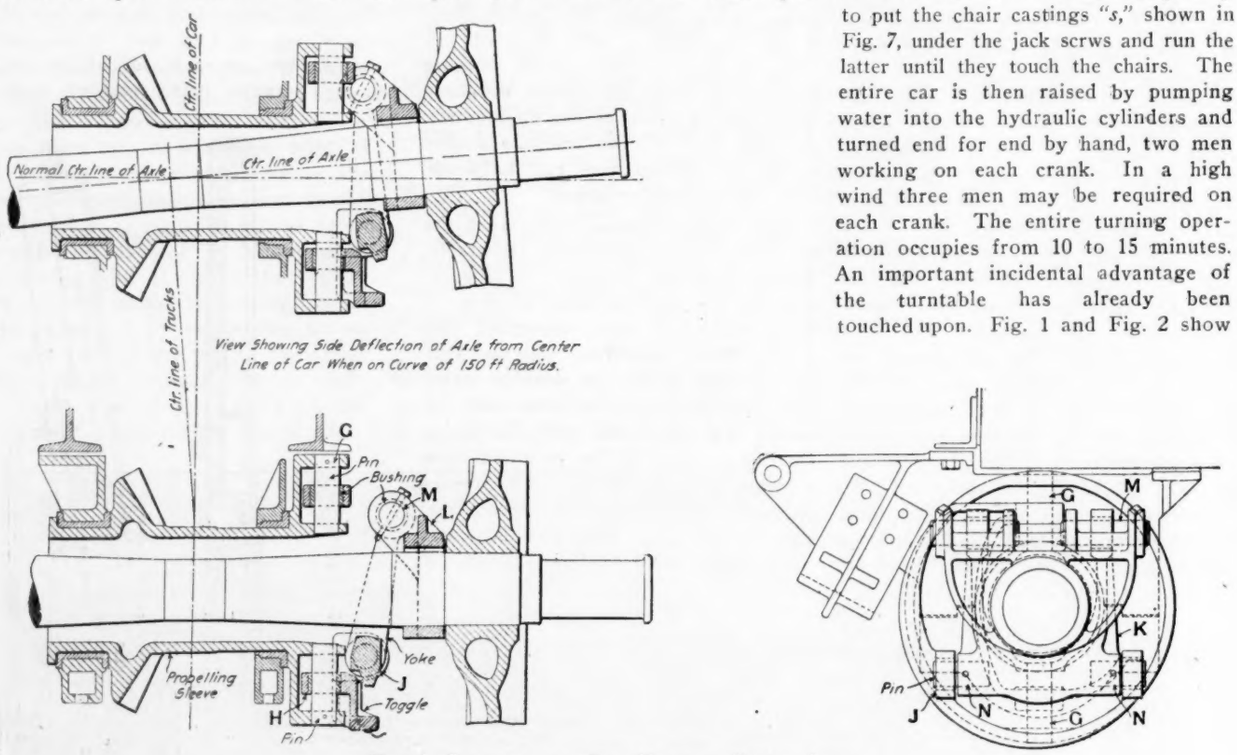



FIG. 6—SECTIONS AND END VIEW OF TOGGLE JOINT.

The tests made since the first machine was put in operation indicate that it will fully come up to expectations. The first machine was built with slow gear only, having a maximum speed of 15 miles per hour. The results of its test on grades have already been mentioned. It has since been in constant use on the western divisions of the Santa Fe and on heavy grades. The fast propelling gear herein described has now been added and two machines thus equipped have been built and shipped. On one of these, built for the Canadian Pacific railway, the following speed test was made: The machine hauled an ordinary passenger car from South Milwaukee to Racine and return, a distance of 12.6 miles each way. The run to Racine was made in 31 minutes, an average speed of 24.4 miles per hour, two miles being made at a speed of 30 miles per hour. The return run was made in 37 minutes, making an average speed of 20.5 miles per hour.

The shipping weight of the machine without the turntable, as shown in Fig. 4, is about 147,000 pounds; with the turntable, as shown in Figs. 1, 2 and 3, about 160,000 pounds. It is equipped with either a No. 2 steam hammer or a 3,500-pound drop hammer, or both. The leaders are so made that either hammer can be used without change. The reach for driving piles is 18 feet ahead of the center of the forward wheel, or 19 feet on each side, as already mentioned; while with the turntable, 32 feet on either side can be reached. The leaders are 40 feet long. The construction is entirely of metal, except the house.

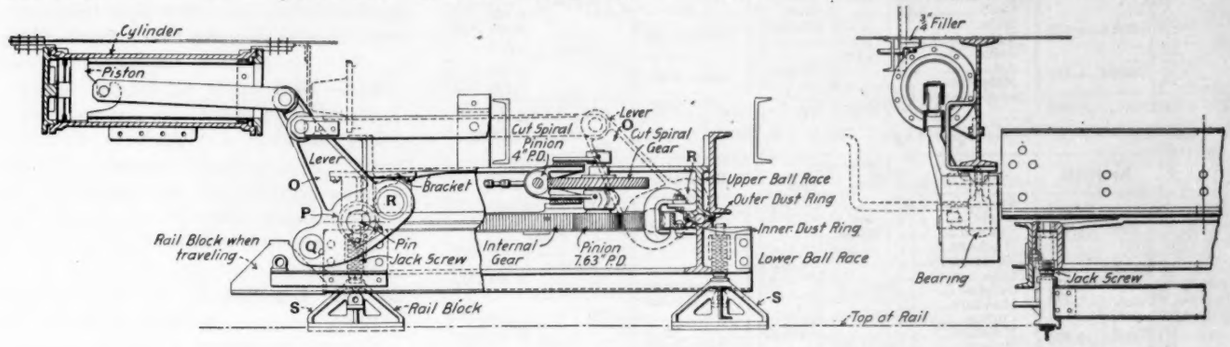



FIG. 7—PLAN AND SIDE AND FRONT ELEVATION OF HYDRAULIC TURNTABLE OF PILE DRIVER.

# THE LIMIT OF FUEL-ECONOMY IN THE IRON BLAST FURNACE*

BY N. M. LANGDON.[1]

In considering the magnificent success of Mr. Gayley's bold experiment of applying dry blast to the blast furnace, whereby a saving of 20 per cent of fuel per ton of iron is effected, the question arises whether still further economy in fuel is possible, and, if so, how it is to be attained?

The manner in which the heat generated in the furnace is utilized in the production of pig iron may be determined, by the method of Bell and Gruner, for any furnace for which the necessary data are obtainable; and the study of the operation, under various conditions, of a number of furnaces, for which such information has been worked out, should enable us to form some conclusion on the subject.

The tables and calculations given below cover the operations of several furnaces reported in our *Transactions;* also the two furnaces using natural and dry blast in Mr. Gayley's experiment, for which the heat-equation has been

| | | | C. | D. | J. | K. | L. | M1. | M2. | N1. | N2. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Capacity, cu. ft. | | 18,000 | 18,000 | 25,500 | 6,700 | ..... | 7,445 | 7,445 | 3,416 | 3,416 |
| 2. | Capacity above tuyeres, cu. ft. | | 16,896 | 16,896 | ..... | 6,424 | ..... | 6,666 | 6,666 | 3,167 | 3,167 |
| 3. | Hearth area, sq. ft. | | 143.1 | 143.1 | ..... | 56.7 | ..... | 86.6 | 86.6 | 33.2 | 33.2 |
| 4. | Output per 24 hours, long tons | | 358 | 447 | 78.6 | 130 | 194 | 236.4 | 236.4 | 105.6 | 105.6 |
| 5. | Ore used per ton of iron, long tons. | | 1.776 | 1.776 | 2.40 | 1.57 | 1.70 | [c]1.662 | [c]1.662 | 2.005 | 2.005 |
| 6. | Limestone, per ton iron, long tons. | | 0.444 | 0.444 | 0.55 | 0.27 | 0.589 | 0.389 | 0.389 | 0.151 | 0.151 |
| 7. | Fuel, per ton of iron, long tons | | 0.958 | 0.770 | 1.0 | 0.779 | 1.008 | 0.758 | 0.758 | 0.776 | 0.776 |
| 8. | Fuel, per ton of iron, lb. | | 2,147 | 1,726 | 2,240 | 1,745 | 2,258 | 1,698 | 1,698 | 1,738 | 1,738 |
| 9. | Temperature of blast, deg. C. | | 382 | 465 | 704 | 650 | 560 | 455 | 455 | 427 | 427 |
| 10. | Temperature of gas, deg. C. | | 281 | 191 | 250 | 125 | 200 | 200 | 200 | 204 | 204 |
| 11. | Composition of gas by weight.[b] | per cent. CO | 1.260 | 0.8925 | 1.434 | 0.943 | 1.2978 | [c]0.7922 | [c]8801 | [c]0.7583 | [c]0.8944 |
| 12. | | per cent. $CO_2$ | 1.155 | 1.1275 | 1.095 | 0.9845 | 0.9746 | 1.1725 | [c]1.0344 | 1.192 | [c]0.9779 |
| 13. | Moisture per cu. ft. blast, grains | | 5.66 | 1.75 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 14. | Moisture per ton of iron, tons | | 0.045 | 0.01 | 0.0315 | 0.0241 | 0.0368 | 0.0366 | 0.0344 | 0.025 | 0.023 |
| 15. | Composition of pig-iron. | per cent. iron | 95.0 | 95.0 | ..... | ..... | 94.4 | 95.5 | 95.5 | 95.5 | 95.5 |
| 16. | | per cent. Si, etc. | 1.0 | 1.0 | ..... | ..... | 2.1 | 1.0 | 1.0 | 1.0 | 1.0 |
| 17. | | per cent. carbon | 4.0 | 4.0 | ..... | ..... | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |
| 18. | Composition of ore. | per cent. iron | 53.5 | 53.5 | ..... | ..... | 55.40 | 55.4 | 55.4 | 47.60 | 47.60 |
| 19. | | per cent. moisture | 10.0 | 10.0 | ..... | ..... | 8.89 | 12.0 | 12.0 | 10.82 | 10.82 |
| 20. | | per cent. volatile | 0.0 | 0.0 | ..... | ..... | 2.12 | 3.0 | 3.0 | 2.90 | 2.90 |
| 21. | | per cent. gangue | 13.6 | 13.6 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 22. | Composition of limestone. | per cent. $CO_2$ | 42.6 | 42.6 | ..... | ..... | 38.84 | 40.0 | 40.0 | 44.0 | 44.0 |
| 23. | | per cent. moisture | 0.0 | 0.0 | ..... | ..... | 4.60 | ..... | ..... | 4.0 | 4.0 |
| 24. | | per cent. gangue | 57.4 | 57.4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 25. | Composition of fuel. | per cent. carbon | 88.0 | 88.0 | ..... | ..... | 78.94 | 86.0 | 86.0 | 86.0 | 86.0 |
| 26. | | per cent. moisture | 1.0 | 1.0 | ..... | ..... | 5.40 | 1.5 | 1.5 | 6.0 | 6.0 |
| 27. | | per cent. volatile | 0.0 | 0.0 | ..... | ..... | 1.71 | 1.0 | 1.0 | 6.0 | 6.0 |
| 28. | | per cent. ash | 11.0 | 11.0 | ..... | ..... | ..... | ..... | ..... | 2.0 | 2.0 |

[a] Including 0.102 ton of pig-iron and scrap charged.

[b] In columns A and B (omitted from this table because they are otherwise identical with C and D respectively), the composition of gas is given in percentage by volume as, for A, 22.3 CO, and 13.0 $CO_2$; for B, 19.9 CO, and 160 $CO_2$.

[c] Calculated in preparing following tables, and inserted in this table for purposes of comparison.

TABLE I—DATA GIVEN, CALCULATED, OR (UNDER $M_1$, $M_2$, $N_1$ AND $N_2$) ASSUMED, FOR THE FURNACES NAMED.

*October bulletin of American Institute of Mining Engineers.

[1]Mancelona, Mich.

| Item. | C. Received. | | Discharged. Iron. | Slag. | Gas. |
|---|---|---|---|---|---|
| 1 | Ore.....1.776 | Fe..... | 0.95 | ..... | 0.407 O |
| 2 | | Si, etc..... | 0.01 | ..... | 0.011 O |
| 3 | | Gangue..... | ..... | 0.220 | ..... |
| 4 | | Moisture... | ..... | ..... | 0.178 $H_2O$ |
| 5 | | Volatile.... | ..... | ..... | ..... |
| 6 | Limestone, 0.444 | $CO_2$..... | ..... | ..... | 0.190 $CO_2$ |
| 7 | | Gangue..... | ..... | 0.254 | ..... |
| 8 | | Moisture... | ..... | ..... | ..... |
| 9 | Coke....0.958 | Carbon..... | 0.04 | ..... | 0.803 C |
| 10 | | Moisture... | ..... | ..... | 0.009 $H_2O$ |
| 11 | | Volatile.... | ..... | ..... | ..... |
| 12 | | Ash..... | ..... | 0.106 | ..... |
| 13 | Blast...4.392 | Air..... | ..... | ..... | 4.347 air |
| 14 | | Moisture... | ..... | ..... | 0.045 $H_2O$ |
| 15 | Total.....7.570 | | 1.00 | 0.580 | 5.990 |

| Item. | D. Received. | | Discharged. Iron. | Slag. | Gas. |
|---|---|---|---|---|---|
| 1 | Ore.....1.776 | Fe..... | 0.95 | ..... | 0.407 O |
| 2 | | Si, etc..... | 0.01 | ..... | 0.011 O |
| 3 | | Gangue..... | ..... | 0.220 | ..... |
| 4 | | Moisture... | ..... | ..... | 0.178 $H_2O$ |
| 5 | | Volatile.... | ..... | ..... | ..... |
| 6 | Limestone, 0.444 | $CO_2$..... | ..... | ..... | 0.190 $CO_2$ |
| 7 | | Gangue..... | ..... | 0.254 | ..... |
| 8 | | Moisture... | ..... | ..... | ..... |
| 9 | Coke....0.770 | Carbon..... | 0.04 | ..... | 0.638 C |
| 10 | | Moisture... | ..... | ..... | 0.008 $H_2O$ |
| 11 | | Volatile.... | ..... | ..... | ..... |
| 12 | | Ash..... | ..... | 0.084 | ..... |
| 13 | Blast...3.361 | Air..... | ..... | ..... | 3.351 air |
| 14 | | Moisture... | ..... | ..... | 0.010 $H_2O$ |
| 15 | Total.....6.351 | | 1.00 | 0.558 | 4.793 |

| Item. | E. Received. | | Discharged. Iron. | Slag. | Gas. |
|---|---|---|---|---|---|
| 1 | Ore.....1.776 | Fe..... | 0.95 | ..... | 0.407 O |
| 2 | | Si, etc..... | 0.01 | ..... | 0.011 O |
| 3 | | Gangue..... | ..... | 0.220 | ..... |
| 4 | | Moisture... | ..... | ..... | 0.178 $H_2O$ |
| 5 | | Volatile.... | ..... | ..... | ..... |
| 6 | Limestone, 0.444 | $CO_2$..... | ..... | ..... | 0.190 $CO_2$ |
| 7 | | Gangue..... | ..... | 0.254 | ..... |
| 8 | | Moisture... | ..... | ..... | ..... |
| 9 | Coke....0.770 | Carbon..... | 0.04 | ..... | 0.638 C |
| 10 | | Moisture... | ..... | ..... | 0.008 $H_2O$ |
| 11 | | Volatile.... | ..... | ..... | ..... |
| 12 | | Ash..... | ..... | 0.084 | ..... |
| 13 | Blast...3.440 | Air..... | ..... | ..... | 3.395 air |
| 14 | | Moisture... | ..... | ..... | 0.045 $H_2O$ |
| 15 | Total. .....6.430 | | 1.00 | 0.558 | 4.872 |

| Item. | E1. Received. | | Discharged. Iron. | Slag. | Gas. |
|---|---|---|---|---|---|
| 1 | Ore.....1.776 | Fe..... | 0.95 | ..... | 0.407 O |
| 2 | | Si, etc..... | 0.01 | ..... | 0.011 O |
| 3 | | Gangue..... | ..... | 0.220 | ..... |
| 4 | | Moisture... | ..... | ..... | 0.178 $H_2O$ |
| 5 | | Volatile.... | ..... | ..... | ..... |
| 6 | Limestone, 0.444 | $CO_2$..... | ..... | ..... | 0.190 $CO_2$ |
| 7 | | Gangue..... | ..... | 0.254 | ..... |
| 8 | | Moisture... | ..... | ..... | ..... |
| 9 | Coke....0.712 | Carbon..... | 0.04 | ..... | 0.587 C |
| 10 | | Moisture... | ..... | ..... | 0.007 $H_2O$ |
| 11 | | Volatile.... | ..... | ..... | ..... |
| 12 | | Ash..... | ..... | 0.078 | ..... |
| 13 | Blast...3.064 | Air..... | ..... | ..... | 3.054 air |
| 14 | | Moisture... | ..... | ..... | 0.010 $H_2O$ |
| 15 | Total.....5.996 | | 1.00 | 0.552 | 4.444 |

| Item. | F. Received. | | Discharged. Iron. | Slag. | Gas. |
|---|---|---|---|---|---|
| 1 | Ore.....1.776 | Fe..... | 0.95 | ..... | 0.407 O |
| 2 | | Si, etc..... | 0.01 | ..... | 0.011 O |
| 3 | | Gangue..... | ..... | 0.220 | ..... |
| 4 | | Moisture... | ..... | ..... | 0.178 $H_2O$ |
| 5 | | Volatile.... | ..... | ..... | ..... |
| 6 | Limestone, 0.444 | $CO_2$..... | ..... | ..... | 0.190 $CO_2$ |
| 7 | | Gangue..... | ..... | 0.254 | ..... |
| 8 | | Moisture... | ..... | ..... | ..... |
| 9 | Coke....0.959 | Carbon..... | 0.04 | ..... | 0.804 C |
| 10 | | Moisture... | ..... | ..... | 0.009 $H_2O$ |
| 11 | | Volatile.... | ..... | ..... | ..... |
| 12 | | Ash..... | ..... | 0.106 | ..... |
| 13 | Blast...4.319 | Air..... | ..... | ..... | 4.309 air |
| 14 | | Moisture... | ..... | ..... | 0.010 $H_2O$ |
| 15 | Total.....7.498 | | 1.00 | 0.580 | 5.918 |

| Item. | G. Received. | | Discharged. Iron. | Slag. | Gas. |
|---|---|---|---|---|---|
| 1 | Ore.....1.598 | Fe..... | 0.95 | ..... | 0.407 O |
| 2 | | Si, etc..... | 0.01 | ..... | 0.011 O |
| 3 | | Gangue..... | ..... | 0.220 | ..... |
| 4 | | Moisture... | ..... | ..... | ..... |
| 5 | | Volatile.... | ..... | ..... | ..... |
| 6 | Limestone, 0.444 | $CO_2$..... | ..... | ..... | 0.190 $CO_2$ |
| 7 | | Gangue..... | ..... | 0.254 | ..... |
| 8 | | Moisture... | ..... | ..... | ..... |
| 9 | Coke....0.716 | Carbon..... | 0.04 | ..... | 0.590 C |
| 10 | | Moisture... | ..... | ..... | 0.007 $H_2O$ |
| 11 | | Volatile.... | ..... | ..... | ..... |
| 12 | | Ash..... | ..... | 0.079 | ..... |
| 13 | Blast...3.084 | Air..... | ..... | ..... | 5.074 air |
| 14 | | Moisture... | ..... | ..... | 0.010 $H_2O$ |
| 15 | Total.....5.842 | | 1.00 | 0.553 | 4.269 |

| Item. | H. Received. | | Discharged. Iron. | Slag. | Gas. |
|---|---|---|---|---|---|
| 1 | Ore.....1.598 | Fe..... | 0.95 | ..... | 0.407 O |
| 2 | | Si, etc..... | 0.04 | ..... | 0.011 O |
| 3 | | Gangue..... | ..... | 0.220 | ..... |
| 4 | | Moisture... | ..... | ..... | ..... |
| 5 | | Volatile.... | ..... | ..... | ..... |
| 6 | Limestone, 0.254 | $CO_2$..... | ..... | ..... | ..... |
| 7 | | Gangue..... | ..... | 0.254 | ..... |
| 8 | | Moisture... | ..... | ..... | ..... |
| 9 | Coke....0.508 | Carbon..... | 0.04 | ..... | 0.407 C |
| 10 | | Moisture... | ..... | ..... | 0.005 $H_2O$ |
| 11 | | Volatile.... | ..... | ..... | ..... |
| 12 | | Ash..... | ..... | 0.056 | ..... |
| 13 | Blast...2.073 | Air..... | ..... | ..... | 2.067 air |
| 14 | | Moisture... | ..... | ..... | 0.006 $H_2O$ |
| 15 | Total.....4.433 | | 1.00 | 0.530 | 2.903 |

| Item. | I. Received. | | Discharged. Iron. | Slag. | Gas. |
|---|---|---|---|---|---|
| 1 | Ore.....1.593 | Fe..... | 0.95 | ..... | 0.407 O |
| 2 | | Si, etc..... | 0.01 | ..... | 0.011 O |
| 3 | | Gangue..... | ..... | 0.220 | ..... |
| 4 | | Moisture... | ..... | ..... | ..... |
| 5 | | Volatile.... | ..... | ..... | ..... |
| 6 | Limestone, 0.254 | $CO_2$..... | ..... | ..... | ..... |
| 7 | | Gangue..... | ..... | 0.254 | ..... |
| 8 | | Moisture... | ..... | ..... | ..... |
| 9 | Coke....0.610 | Carbon..... | 0.04 | ..... | 0.497 C |
| 10 | | Moisture... | ..... | ..... | 0.006 $H_2O$ |
| 11 | | Volatile.... | ..... | ..... | ..... |
| 12 | | Ash..... | ..... | 0.060 | ..... |
| 13 | Blast...0.602 | Air..... | ..... | ..... | 0.600 air |
| 14 | | Moisture... | ..... | ..... | 0.002 $H_2O$ |
| 15 | Total.....3.064 | | 1.00 | 0.534 | 1.523 |

TABLE II—STOCK-EQUATION OF MATERIALS RECEIVED INTO AND DISCHARGED FROM BLAST FURNACES. IN GROSS TONS.

worked out by Prof. Joseph W. Richards in his admirable discussion[2] of Mr. Gayley's paper, "The Application of Dry Air Blast to the Manufacture of Iron", and finally, various hypothetical furnaces. The full list is as follows:

A. Isabella furnace, with natural blast.

B. Isabella furnace, with dry blast. The data stated for A and B in Table III are those given by Prof. Richards, except that the heat-units are given for one unit of iron instead of 100 units, and some items of heat supplied, as stated by Richards, have been subdivided, the total being the same as given by Richards. (Columns A and B are introduced in Table III for comparison with C and D.)

C. Isabella furnace, with natural blast, for which I have used my own factors in figuring the heat-units.

D. Isabella furnace, with dry blast, for which my own factors have been used for figuring the heat-units.

E. Hypothetical furnace, in which the conditions are the same as in C, except that the temperature of blast is assumed as high enough to reduce the fuel to the same amount as in D.

E1. Hypothetical furnace. Conditions the same as in D, except that temperature of blast is raised to 1,200 degrees Fahr.

E2. Hypothetical furnace. Conditions the same as in C, except that temperature of blast is 1,200 degrees Fahr. Temperature of gas, radiation, and efficiency of reduction the same as in the dry blast furnace.

F. Hypothetical furnace. Conditions same as in D, except that temperature of blast is assumed at 75 degrees Fahr.

F1. Hypothetical furnace. Conditions same as in C, except that temperature of blast is assumed at 75 degrees Fahr.

G. Hypothetical furnace. Conditions same as in D, except that the moisture of ore is assumed to have been expelled before charging into the furnace.

G1. Hypothetical furnace. Conditions same as in D, except that the $CO_2$ of limestone is assumed to have been eliminated before charging.

H. Hypothetical furnace, in which the following conditions are assumed: blast dry; no moisture in the ore; no $CO_2$ in the limestone; temperature of blast, 1,200 degrees Fahr.; temperature of gas, 376 degrees Fahr.; efficiency of reduction, 86.1 per cent as in C; radiation 10 per cent of total heat developed.

H1. Theoretical furnace, with conditions same as in H, except that the moisture of blast is assumed as in C.

I. Theoretical furnace. Conditions same as in H, except that it is assumed that the nitrogen of the blast has been eliminated.

J. Clarence furnace of Bell Bros.[3]

K. Illinois Steel Co.'s furnace, Union No. 1.[4]

L. Sharon furnace No. 2, in which I conducted an experiment covering a period of about two weeks, as I recollect it, in December, 1898.

M1. Alice furnace, Sharpsville, Pa., from data furnished by C. I. Rader, manager, in which the efficiency of reduction is assumed at 100 per cent.

M2. Alice furnace, same conditions as M1, except that the efficiency of reduction is assumed at 86.4 per cent, practically the same as in C.

N1. Antrim Iron Co.'s furnace (charcoal), for the month of January, 1901, in which the efficiency of reduction is assumed at 100 per cent.

N2. Antrim Iron Co.'s furnace, with efficiency of reduction assumed at 81 per cent.

Q. Hypothetical furnace. Conditions same as in C, except that the ore is assumed to be protoxide instead of a peroxide.

Q1. Hypothetical furnace. Conditions same as in Q, except that the

[2] *Trans.*, xxxvi., 745 to 759 (1906).

[3] *Trans.*, xix., 959 (1890-91).

[4] *Trans.*, xx., 287 (1891).

efficiency of reduction is assumed at 50.8 per cent.

X. Hypothetical furnace, with the following assumptions: Charge contains only oxides without slag-making elements; fuel, pure carbon; temperatures of gas and blast same as in C; iron of the ore is peroxide; blast free from moisture; efficiency of reduction, 100 per cent.

X1. Theoretical furnace, demonstrating the highest theoretical blast temperature required, with conditions same as in C, so far as they apply, except that efficiency of reduction is assumed at 100 per cent, and temperature of blast as in D.

In presenting data of this kind, it is unfortunate that all writers do not use the same formulas and factors. While the results may be practically the same, comparison is somewhat complicated, and often requires recalculation of the data. In my tables, the data of the Gayley (Isabella) furnaces using natural and dry blast are given first in relative quantities as stated by Richards, and then, together with the similar data worked out for the other furnaces, according to the formulas and factors given by Gruner.

Table I contains the data given or assumed of the actual furnaces on which the succeeding tables are based.

Table II shows the stock-equation, or materials received into, and discharged from, each of the furnaces named. All of the materials, in the form of ore, limestone, fuel and blast, which enter into a furnace come out again in the form of pig iron, slag, flue dust, and gas, and when fully accounted for, make an even balance.

Table III shows the heat-equation for each furnace. All of the heat generated in the furnace by the combustion of the fuel, or taken in with the blast, is fully accounted for and evenly balanced by the heat consumed in the transformation of the materials, or lost by conduction and radiation.

Table IV contains data calculated for each furnace named.

### Constants.

The following are the constants adopted or calculated from Gruner:

| | |
|---|---|
| Reduction of iron | weight of O in oxide of iron × 4,400 |
| Reduction of silicon | weight of O in silicon × 6,125 |
| Fusion of pig | weight of pig × 310 |
| Fusion of slag | weight of slag × 500 |
| Expulsion of moisture | weight of moisture × 606.5 |
| Expulsion of carbonic acid | weight of $CO_2$ × 849 |
| Decomposition of $H_2O$ | weight of $H_2O$ × 3 225 |
| Carried off in gas | weight of gas × temp. (C.°) × 0.237 |
| Carried in by the blast | weight of blast × temp. (C.°) × 0.237 |
| Heat generated by combustion: | |
| C to CO | weight of C × 2,473 |
| CO to $CO_2$ | weight of C in CO × 5,607 |

Note.—The weight of O in $Fe_2O_3$ multiplied by 4,400 is the same as the weight of Fe multiplied by 1,887, as given by Gruner; also the weight of O in silica multiplied by 6,125 is the same as the weight of Si multiplied by 7,000; and the weight of $CO_2$ in limestone multiplied by 849 is the same as weight $CaCO_3$ multiplied by 373.5.

TABLE II—(CONTINUED)—STOCK-EQUATION OF MATERIALS RECEIVED INTO AND DISCHARGED FROM BLAST FURNACES. IN GROSS TONS.

| Item. | J. Received. | | J. Discharged. Iron. | Slag. | Gas. | K. Received. | K. Discharged. Iron. | Slag. | Gas. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | Fe | 0.95 | ..... | 0.400 O | | 0.94 | ..... | 0.403 O |
| 2 | | Si, etc. | 0.04 | ..... | 0.045 O | | 0.03 | ..... | 0.040 O |
| 3 | Ore.....2.40 | Gangue | ..... | 0.965 | ..... | Ore.....1.570 | ..... | 0.040 | ..... |
| 4 | | Moisture | ..... | ..... | ..... | | ..... | ..... | a0.117 $H_2O$ |
| 5 | | Volatile | ..... | ..... | ..... | | ..... | ..... | ..... |
| 6 | | $CO_2$ | ..... | ..... | 0.242 $CO_2$ | | ..... | ..... | 0.119 $CO_2$ |
| 7 | Limestone, 0.55 | Gangue | ..... | 0.308 | ..... | Limestone, 0.270 | ..... | 0.151 | ..... |
| 8 | | Moisture | ..... | ..... | ..... | | ..... | ..... | ..... |
| 9 | | Carbon | 0.03 | ..... | 0.847 C | | 0.03 | ..... | 0.640 C |
| 10 | Coke.....1.00 | Moisture | ..... | ..... | 0.025 $H_2O$ | Coke....0.779 | ..... | ..... | ..... |
| 11 | | Volatile | ..... | ..... | ..... | | ..... | ..... | ..... |
| 12 | | Ash | ..... | 0.098 | ..... | | ..... | 0.109 | ..... |
| 13 | Blast.....4.36 | Air | ..... | ..... | 4.330 air | Blast...3.132 | ..... | ..... | 3.108 air |
| 14 | | Moisture | ..... | ..... | 0.032 $H_2O$ | | ..... | ..... | 0.024 $H_2O$ |
| 15 | Total.....8.31 | | 1.00 | 1.391 | 5.921 | Total.....5.751 | 1.00 | 0.300 | 4.451 |

| Item. | L. Received. | | L. Discharged. Iron. | Slag. | Gas. | M1. Received. | M1. Discharged. Iron. | Slag. | Gas. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | Fe | 0.944 | ..... | 0.390 O | | 0.955 | ..... | 0.370 O |
| 2 | | Si, etc. | 0.021 | ..... | 0.019 O | | 0.010 | ..... | 0.011 O |
| 3 | Ore.....1.700 | Gangue | ..... | 0.140 | ..... | Ore.....1.560 | ..... | 0.083 | ..... |
| 4 | | Moisture | ..... | ..... | 0.150 $H_2O$ | Iron....0.102 | ..... | ..... | 0.187 $H_2O$ |
| 5 | | Volatile | ..... | ..... | 0.036 vol. | | ..... | ..... | 0.046 vol. |
| 6 | | $CO_2$ | ..... | ..... | 0.223 CO | | ..... | ..... | 0.155 $CO_2$ |
| 7 | Limestone, 0.589 | Gangue | ..... | 0.339 | ..... | Limestone, 0.389 | ..... | 0.234 | ..... |
| 8 | | Moisture | ..... | ..... | 0.027 $H_2O$ | | ..... | ..... | ..... |
| 9 | | Carbon | 0.035 | ..... | 0.761 C | | 0.035 | ..... | 0.617 C |
| 10 | | Moisture | ..... | ..... | 0.054 $H_2O$ | | ..... | ..... | 0.011 $H_2O$ |
| 11 | Coke....1.008 | Volatile | ..... | ..... | 0.017 vol. | Coke...0.758 | ..... | ..... | 0.007 vol. |
| 12 | | Ash | ..... | 0.141 | ..... | | ..... | 0.088 | ..... |
| 13 | Blast....3.842 | Air | ..... | ..... | 3.805 air | Blast...3.552 | ..... | ..... | 3.515 air |
| 14 | | Moisture | ..... | ..... | 0.037 $H_2O$ | | ..... | ..... | a0.037 $H_2O$ |
| 15 | Total.....7.139 | | 1.000 | 0.620 | 5.519 | Total.....6.361 | 1.000 | 0.405 | 4.956 |

| Item. | M2. Received. | | M2. Discharged. Iron. | Slag. | Gas. | N1. Received. | N1. Discharged. Iron. | Slag. | Gas. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | Fe | 0.955 | ..... | 0.370 O | | 0.995 | ..... | 0.409 O |
| 2 | | Si, etc. | 0.010 | ..... | 0.011 O | | 0.010 | ..... | 0.011 O |
| 3 | Ore.....1.560 | Gangue | ..... | 0.083 | ..... | Ore.....2.005 | ..... | 0.346 | ..... |
| 4 | Iron....0.102 | Moisture | ..... | ..... | 0.187 $H_2O$ | | ..... | ..... | 0.217 $H_2O$ |
| 5 | | Volatile | ..... | ..... | 0.046 vol. | | ..... | ..... | 0.058 vol. |
| 6 | | $CO_2$ | ..... | ..... | 0.155 $CO_2$ | | ..... | ..... | 0.066 $CO_2$ |
| 7 | Limestone, 0.389 | Gangue | ..... | 0.234 | ..... | Limestone, 0.151 | ..... | 0.079 | ..... |
| 8 | | Moisture | ..... | ..... | ..... | | ..... | ..... | 0.006 $H_2O$ |
| 9 | | Carbon | 0.035 | ..... | 0.617 C | | 0.035 | ..... | 0.632 C |
| 10 | | Moisture | ..... | ..... | 0.011 $H_2O$ | | ..... | ..... | 0.047 $H_2O$ |
| 11 | Coke....0.758 | Volatile | ..... | ..... | 0.007 vol. | Charcoal, 0.776 | ..... | ..... | 0.047 vol. |
| 12 | | Ash | ..... | 0.088 | ..... | | ..... | 0.015 | ..... |
| 13 | Blast...3.346 | Air | ..... | ..... | 3.311 air | Blast...3.648 | ..... | ..... | 3.623 air |
| 14 | | Moisture | ..... | ..... | 0.035 $H_2O$ | | ..... | ..... | 0.025 $H_2O$ |
| 15 | Total.....6.155 | | 1.000 | 0.405 | 4.75 | Total.....6.580 | 1.000 | 0.440 | 5.140 |

| Item. | N2. Received. | | N2. Discharged. Iron. | Slag. | Gas. |
|---|---|---|---|---|---|
| 1 | | Fe | 0.995 | ..... | 0.409 O |
| 2 | | Si, etc. | 0.010 | ..... | 0.010 O |
| 3 | Ore.....2.005 | Gangue | ..... | 0.346 | ..... |
| 4 | | Moisture | ..... | ..... | 0.217 $H_2O$ |
| 5 | | Volatile | ..... | ..... | 0.058 vol. |
| 6 | | $CO_2$ | ..... | ..... | 0.66 $CO_2$ |
| 7 | Limestone, 0.151 | Gangue | ..... | 0.079 | ..... |
| 8 | | Moisture | ..... | ..... | 0.006 $H_2O$ |
| 9 | | Carbon | 0.035 | ..... | 0.632 C |
| 10 | Charcoal, 0.776 | Moisture | ..... | ..... | 0.047 $H_2O$ |
| 11 | | Volatile | ..... | ..... | 0.047 vol. |
| 12 | | Ash | ..... | 0.015 | ..... |
| 13 | Blast...3.313 | Air | ..... | ..... | 3.286 |
| 14 | | Moisture | ..... | ..... | 0.027 |
| 15 | Total.....6.245 | | 1.000 | 0.440 | 4.805 |

a Assumed.

### Remarks on Tables I to IV.

The blast furnace may be considered as a heat engine, the heat from the fuel and blast being consumed in the transformation of the ore, flux, fuel, and blast introduced into the furnace into pig iron, slag, and gas discharged therefrom, and the inevitable losses inseparable from the operation.

The total heat consumed or required

| Item. | | A. | B. | C. | D. | E. | E1. | F. | G. | H. | I. | J. | K. | L. | M1. | M2. | N1. | N2. | X. | Q. | Q1. | G1. | J1. | H1. | E2 | E3. | F1. | X1. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | HEAT REQUIRED: | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Reduction of iron | 1,638 | 1,638 | 1,791 | 1,791 | 1,791 | 1,791 | 1,791 | 1,791 | 1,791 | 1,791 | 1,760 | 1,773 | 1,716 | 1,628 | 1,628 | 1,800 | 1,800 | 1,791 | 1,192 | 1,192 | 1,791 | 1,760 | 1,791 | 1,791 | 1,791 | 1,791 | 1,791 |
| 2 | Reduction of silicon, etc. | 68 | 68 | 67 | 67 | 67 | 67 | 67 | 67 | 67 | 67 | 189 | 211 | 94 | 67 | 67 | 53 | 53 | 67 | 67 | 67 | 67 | 189 | 67 | 67 | 67 | 67 | 67 |
| 3 | Expulsion of moisture | 113 | 113 | 113 | 113 | 113 | 113 | 113 | 4 | 3 | 4 | 15 | 71 | 141 | 120 | 120 | 164 | 164 | ..... | 113 | 114 | 112 | 10 | 3 | 113 | 112 | 115 | 110 |
| 4 | Expulsion of carbonic acid | 180 | 181 | 161 | 161 | 161 | 161 | 161 | 161 | ..... | ..... | 205 | 100 | 189 | 132 | 132 | 56 | 56 | ..... | 161 | 161 | ..... | 101 | ..... | 161 | 161 | 161 | 161 |
| 5 | Expulsion of volatile in fuel | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 38 | 14 | 14 | 94 | 94 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 6 | Expulsion of volatile in ore | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 7 | Expulsion of combined water in ore | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 8 | Fusion of iron | 290 | 250 | 310 | 310 | 310 | 310 | 310 | 310 | 310 | 310 | 330 | 330 | 330 | 337 | 337 | 300 | 300 | 310 | 310 | 310 | 310 | 330 | 310 | 310 | 310 | 310 | 310 |
| 9 | Fusion of slag | 232 | 227 | 290 | 279 | 279 | 276 | 290 | 276 | 265 | 271 | 770 | 165 | 341 | 223 | 223 | 220 | 220 | ..... | 286 | 294 | 275 | 165 | 266 | 279 | 273 | 302 | 259 |
| 10 | Decomposition of moisture in blast | 145 | 32 | 145 | 32 | 145 | 32 | 32 | 32 | 20 | 6 | 102 | 78 | 118 | 118 | 111 | 80 | 72 | ..... | 145 | 145 | 32 | 62 | 74 | 145 | 145 | 145 | 58 |
| 11 | *Total direct* | 2,626 | 2,509 | 2,877 | 2,753 | 2,866 | 2,750 | 2,764 | 2,641 | 2,456 | 2,449 | 3,371 | 2,728 | 2,967 | 2,639 | 2,632 | 2,767 | 2,759 | 2,168 | 2,274 | 2,283 | 2,587 | 2,617 | 2,511 | 2,866 | 2,859 | 2,891 | 2,756 |
| 12 | Carried off in gas | 438 | 238 | 399 | 217 | 229 | 201 | 268 | 202 | 131 | 69 | 350 | 132 | 260 | 235 | 226 | 247 | 231 | 185 | 365 | 405 | 186 | 224 | 138 | 216 | 188 | 490 | 128 |
| 13 | Carried off in flue dust.[a] | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 14 | Lost by radiation | 771 | 630 | 582 | 411 | 422 | 402 | 413 | 387 | 288 | 279 | 405 | 525 | 313 | 591 | 374 | 638 | 301 | 419 | 470 | 476 | 378 | 278 | 295 | 420 | 416 | 602 | 320 |
| 15 | *Total indirect* | 1,209 | 868 | 981 | 628 | 651 | 603 | 681 | 589 | 419 | 348 | 755 | 657 | 573 | 826 | 600 | 885 | 532 | 604 | 835 | 881 | 564 | 502 | 433 | 636 | 604 | 1,092 | 448 |
| 16 | *Total heat required* | 3,835 | 3,377 | 3,858 | 3,381 | 3,517 | 3,353 | 3,445 | 3,230 | 2,875 | 2,797 | 4,126 | 3,385 | 3,540 | 3,465 | 3,232 | 3,652 | 3,291 | 2,772 | 3,109 | 3,164 | 3,151 | 3,119 | 2,944 | 3,502 | 3,463 | 3,983 | 3,204 |
| | HEAT SUPPLIED: | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 17 | Carried in by the blast | 394 | 399 | 379 | 370 | 464 | 470 | 24 | 339 | 393 | 93 | 727 | 478 | 509 | 383 | 360 | 368 | 334 | 183 | 368 | 409 | 324 | 442 | 413 | 509 | 693 | 31 | 740 |
| 18 | From C burned to CO at the tuyeres | 1,848 | 1,429 | 1,881 | 1,454 | 1,473 | 1,326 | 1,864 | 1,335 | 902 | 1,124 | 1,928 | 1,420 | 1,665 | 1,526 | 1,434 | 1,563 | 1,419 | 879 | 1,734 | 1,928 | 1,271 | 1,206 | 951 | 1,436 | 1,213 | 2,372 | 754 |
| 19 | *Total in zone of fusion* | 2,242 | 1,808 | 2,278 | 1,824 | 1,937 | 1,796 | 1,888 | 1,674 | 1,295 | 1,217 | 2,655 | 1,898 | 2,174 | 1,909 | 1,794 | 1,931 | 1,753 | 1,062 | 2,102 | 2,337 | 1,595 | 1,648 | 1,364 | 1,945 | 1,906 | 2,403 | 1,494 |
| 20 | From C burned to CO | 103 | 121 | 105 | 124 | 105 | 124 | 124 | 124 | 105 | 105 | 167 | 163 | 217 | 0 | 93 | 0 | 144 | ..... | 105 | 248 | 123 | 167 | 105 | 124 | 124 | 105 | ..... |
| 21 | From CO burned to $CO_2$ | 1,490 | 1,448 | 1,475 | 1,433 | 1,475 | 1,433 | 1,433 | 1,433 | 1,475 | 1,475 | 1,304 | 1,324 | 1,149 | 1,556 | 1,345 | 1,721 | 1,394 | 1,710 | 902 | 579 | 1,433 | 1,304 | 1,475 | 1,433 | 1,433 | 1,475 | 1,710 |
| 22 | *Total in zone of reduction* | 1,593 | 1,569 | 1,580 | 1,557 | 1,580 | 1,557 | 1,557 | 1,557 | 1,580 | 1,580 | 1,471 | 1,487 | 1,366 | 1,556 | 1,438 | 1,721 | 1,538 | 1,710 | 1,007 | 827 | 1,556 | 1,471 | 1,580 | 1,557 | 1,557 | 1,580 | 1,710 |
| 23 | *Total heat supplied* | 3,835 | 3,377 | 3,858 | 3,381 | 3,517 | 3,353 | 3,445 | 3,230 | 2,875 | 2,797 | 4,126 | 3,385 | 3,540 | 3,465 | 3,232 | 3,652 | 3,291 | 2,772 | 3,109 | 3,164 | 3,151 | 3,119 | 2,944 | 3,502 | 3,463 | 3,983 | 3,204 |

[a] This item is relatively small and has been neglected in these calculations.

TABLE III—HEAT EQUATION, OR HEAT REQUIRED AND SUPPLIED.

may be subdivided into a number of different items, and the requirement for each item may be traced to its cause, which may be greater or less in one furnace than in another—or in some cases the cause, and consequently the resulting heat-requirement, may be absent; and as the aggregate heat-requirements made up of the different items may be greater or smaller according to the conditions presented, so may the heat-supply from the blast and fuel likewise vary.

The different items which make up the total heat-requirements are given in Table III, items 1 to 16 inclusive. The total of items 1 to 10 as given in item 11 is the direct heat-requirement. That is to say, the heat for each item is in direct proportion to the quantity of the substance for which it is required, contained in the materials introduced into the furnace, as given in Table II.

The total of items 12, 13, and 14, as given in item 15, Table III, is the indirect heat-requirement. It is affected directly by any variation of the total direct heat-requirement, temperature of the blast, gas, etc.; and is inversely proportional to the efficiency with which the fuel is consumed.

Table III shows that items 1 to 8, inclusive, of heat-requirement are precisely the same for furnace C, using natural blast, and furnace D, using dry blast.

Tabulating the differences shown in Table III, in items 9, 10, 12, and 14 of heat-requirements, and 17, 18, 19, and 20 of heat-supply, between furnaces C and D, we have the figures given in Table V.

It will be noted that the furnaces after K in the foregoing list, and in some of the tables, are not discussed in the text. This is due to the circumstance that the tables were originally prepared to accompany a wider consideration of blast furnace theory, in which the effect of hypothetical changes in dimensions, etc., was to be considered. This more general discussion has been postponed to a future opportunity, so as to base the present paper chiefly upon data of actual practice. But, at the suggestion of the secretary, the apparently superfluous columns have been retained in the tables as valuable for further study and reference.

(Continued in next issue.)

| | C. | D. | E. | E1. | F. | G. | H. | I. | J. | K. | L. | M1 | M2. | N1. | N2. | X. | Q. | Q1. | G1. | J1. | H1. | E2. | E3. | F1. | X1. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Carbon of CO burned to $CO_2$ in reducing-zone, tons | 0.263 | 0.2555 | 0.263 | 0.2555 | 0.2555 | 0.2555 | 0.263 | 0.263 | 0.2325 | 0.236 | 0.2049 | 0.2775 | 0.2398 | 0.307 | 0.2487 | 0.305 | 0.1009 | 0.1033 | 0.2555 | 0.2325 | 0.2630 | 0.2555 | 0.2555 | 0.2630 | 0.305 |
| 2. Carbon of CO possible to have burned to $CO_2$ in reducing-zone, tons | 0.3054 | 0.3054 | 0.3054 | 0.3054 | 0.3054 | 0.3054 | 0.3054 | 0.3054 | 0.3000 | 0.302 | 0.2925 | 0.2775 | 0.2775 | 0.307 | 0.307 | 0.305 | 0.2033 | 0.2033 | 0.3053 | 0.3000 | 0.3053 | 0.3053 | 0.3053 | 0.3053 | 0.305 |
| 3. Efficiency of reduction, per cent | 86.1 | 83.7 | 86.1 | 83.7 | 83.7 | 83.7 | 86.1 | 86.1 | 77.5 | 78.1 | 70.0 | 100.0 | 86.4 | 100.0 | 81.0 | 100 | 79.1 | 50.8 | 83.7 | 77.5 | 87.1 | 83.7 | 83.7 | 86.1 | 100 |
| 4. Carbon burned to CO in reducing-zone, tons | 0.0424 | 0.0499 | 0.0424 | 0.0499 | 0.0499 | 0.0499 | 0.0424 | 0.0424 | 0.0675 | 0.066 | 0.0676 | 0 | 0.0377 | 0 | 0.0583 | 0 | 0.0424 | 0.1000 | 0.0499 | 0.0675 | 0.0424 | 0.0499 | 0.0499 | 0.0424 | 0 |
| 5. Carbonic oxide (CO) in gas, tons | 1.25 | 0.8925 | 0.875 | 0.7726 | 1.246 | 0.7805 | 0.336 | 0.546 | 1.434 | 0.943 | 1.2978 | 0.7922 | 0.8801 | 0.7583 | 0.8944 | 0.1181 | 1.359 | 1.811 | 0.7196 | 0.7525 | 0.3830 | 0.8752 | 0.6648 | 1.7239 | 0 |
| 6. Carbonic acid ($CO_2$) in gas, tons | 1.155 | 1.1275 | 1.155 | 1.1275 | 1.1275 | 1.1275 | 0.9643 | 0.9643 | 1.0945 | 0.9845 | 0.9746 | 1.1725 | 1.0344 | 1.192 | 0.9779 | 1.1183 | 0.7806 | 0.5694 | 0.9368 | 0.9720 | 0.9643 | 1.1275 | 1.1275 | 1.1550 | 0.1309 |
| 7. Ratio $\frac{CO_2}{CO}$ by weight | 0.916 | 1.263 | 1.32 | 1.4594 | 0.905 | 1.444 | 2.870 | 1.766 | 0.763 | 1.044 | 0.751 | 1.480 | 1.1753 | 1.572 | 1.0933 | 9.4691 | 0.5735 | 0.3144 | 1.3018 | 1.3180 | 2.5180 | 1.2800 | 1.6960 | 0.6700 | 0 |
| 8. Efficiency of utilization of fuel, per cent | 93.5 | 91.5 | 92.8 | 92.3 | 92.4 | 91.2 | 91.3 | 92.0 | 91.6 | 90.1 | 87.8 | 100.0 | 93.9 | 100.0 | 90.9 | 100 | 92. | 83.1 | 91.0 | 87.6 | 91.4 | 92.6 | 92.5 | 94.4 | 100 |
| 9. Active capacity (above tuyeres), cu. ft | 16,896 | 16,896 | 16,896 | 16,896 | 16,896 | 16,896 | 16,896 | 16,896 | ..... | 6,424 | ..... | 6,666 | 6,666 | 3,167 | 3,167 | 16,896 | 16,896 | 16,896 | 16,896 | ..... | 16,896 | 16,896 | 16,896 | 16,896 | 16,896 |
| 10. Hearth-area, sq. ft | 143.1 | 143.1 | 143.1 | 143.1 | 143.1 | 143.1 | 143.1 | 143.1 | ..... | 56.7 | 63.6 | 86.6 | 86.6 | 33.2 | 33.2 | 143.1 | 143.1 | 143.1 | 143.1 | ..... | 143.1 | 143.1 | 143.1 | 143.1 | 143.1 |
| 11. Ratio of hearth-area to active capacity, 1 to | 118 | 118 | 118 | 118 | 118 | 118 | 118 | 118 | ..... | 113 | ..... | 77 | 77 | 95.4 | 95.4 | 118 | 118 | 118 | 118 | ..... | 118 | 118 | 118 | 118 | 118 |
| 12. Output of iron per 24 hr., tons | 358 | 447 | 447 | 484 | 359 | 481 | 678 | 564 | 78.6 | 130 | 194 | 236.4 | 236.4 | 105.6 | 105.6 | 768 | 385 | 328 | 502 | ..... | 647 | 450 | 520 | 290 | 875 |
| 13. Fuel consumed per ton of iron, lb | 2,147 | 1,726 | 1,726 | 1,595 | 2,148 | 1,604 | 1,138 | 1,367 | 2,240 | 1,745 | 2,258 | 1,698 | 1,698 | 1,738 | 1,738 | 4886 | 1,994 | 2,341 | 1,537 | 1,494 | 1,189 | 1,707 | 1,478 | 2,652 | 878 |
| 14. Rate of driving: lb. C burned in 24 hr. per cu. ft | 36.0 | 35 | 35 | 34.4 | 36 | 34 | 33 | 34 | 5.48 | 26 | ..... | 49.0 | 46.0 | 47.2 | 42.9 | 36 | 36 | 34 | 34 | ..... | 33 | 35 | 34 | 37 | 35 |
| 15. Rate of driving: lb. C burned in 24 hr. per sq. ft. hearth-area | 4,265 | 4,118 | 4,170 | 4,066 | 4,240 | 4,060 | 3,872 | 4,016 | ..... | 2,948 | 4,601 | 3,773 | 3,542 | 4,500 | 4,087 | 4,277 | 4,226 | 4,005 | 4,041 | ..... | 3,900 | 4,093 | 4,000 | 4,358 | 4,181 |

[a] Carbon, equivalent to 1,006 lb. coke.

TABLE IV—DATA OF OPERATION, EFFICIENCY, ETC., CALCULATED FOR FURNACES NAMED.

# INTERNAL COMBUSTION PUMP*

A unique method of utilizing the heat energy of combustible gases which is attracting much attention among European engineers is presented herewith. The device is the design of H. A. Humphrey, who is known as an authority on combustion

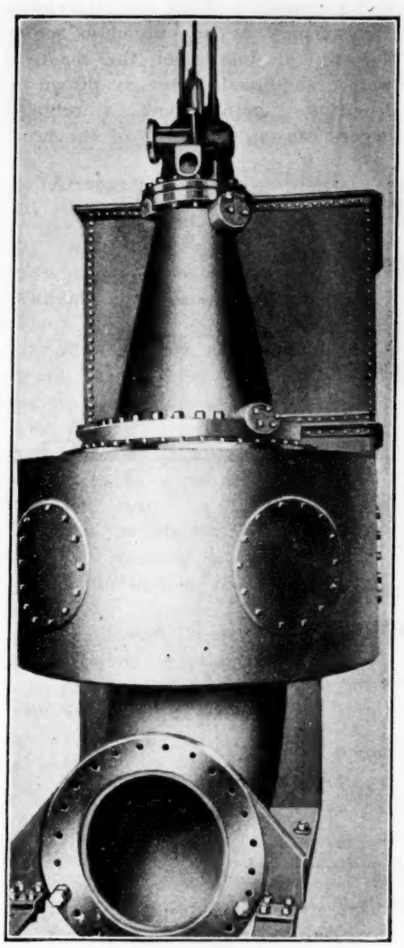


FIG. 1—PUMP AS ERECTED.

engine practice and has recently been thoroughly tested by Prof. W. C. Unwin, whose conclusions, also presented in full, will be accepted as authoritative.

The apparatus, shown in Fig. 1 as erected, may be considered as a new type of initial-combustion prime-mover for the operation of liquids. The pump is suitable for working with producer gas, suction gas, lighting gas, petrol, or paraffine, and the thermo-dynamic cycle on which the pump works has a greater efficiency than the Otto cycle. There are no moving parts except the mushroom valves, and the use of a flywheel is not necessary since a column of water, forming part of the water pumped, acts as a reciprocating flywheel.

The water column, which also acts as a piston, has four unequal strokes, such as theory requires when expansion is carried to atmospheric pressure. These strokes are: A long stroke during combustion and expansion, another long stroke during exhaust, a shorter stroke during suction, and a still shorter stroke during compression. There is no valve across the discharge pipe at any point, so that the water has a free passage from the explosion chamber to the high-level tank.

The action of one of the simplest types of pump can be best explained by reference to the drawing, Fig. 2. The pump proper is built up from three main castings. C is the combustion chamber, W is the water-valve chamber, and a bend connects the pump to the discharge pipe D and thus to the elevated tank H. The suction tank G is extended to embrace the valve-box chamber, as shown, so that there is a free access of water to all the water valves V. These water valves are plain mushroom valves, opening inwards, and held on their seats by light springs. In the top of the combustion chamber are fitted an inlet valve A and an exhaust valve E. A simple interlocking gear is arranged between these two valves, so that when valve A opens and closes it locks shut and releases valve E, and when valve E opens and closes it locks itself shut and releases valve A. Consequently each time that suction occurs in the chamber these valves open in turn.

Imagine a charge of gas and air to be compressed in the top of chamber C and fired by a sparking plug, which projects through the top casting. All the valves are shut when explosion occurs, and the increase in pressure drives the water downwards in the pump and sets the whole column of water in the discharge pipe in motion. The column of water attains kinetic energy while work is being done upon it by the expanding gases, so that when these gases reach atmospheric pressure the column of water may be moving at, say, six feet per second. The motion of this column of water cannot be suddenly arrested, hence the pressure in C tends to fall below that of the atmosphere, the exhaust valve E opens, and also the water valves V. Water rushes in through the water valves, mostly to follow the moving column in pipe D, but partly to rise in chamber C in an effort to reach the same level inside the chamber as exists in the suction tank. When the kinetic energy of the moving column has expended itself by forcing water into the high-level tank it comes to rest, and, there being nothing to prevent a return flow, the column starts to move back towards the pump and gains velocity until the water reaches the level of the exhaust valve, which it shuts by impact. A certain quantity of burnt products is now imprisoned in the cushion space F, and the energy of the moving column is expended in compressing this gas cushion to a greater pressure than that due to the static head of the water in tank H. Hence a second outward movement of the column results, and when the water reaches the level of valve E the pressure in the space F is again atmospheric, and further movement of the water opens valve A against a light spring and draws in a fresh charge of gas and air. If there were no friction the water would fall to the same level as

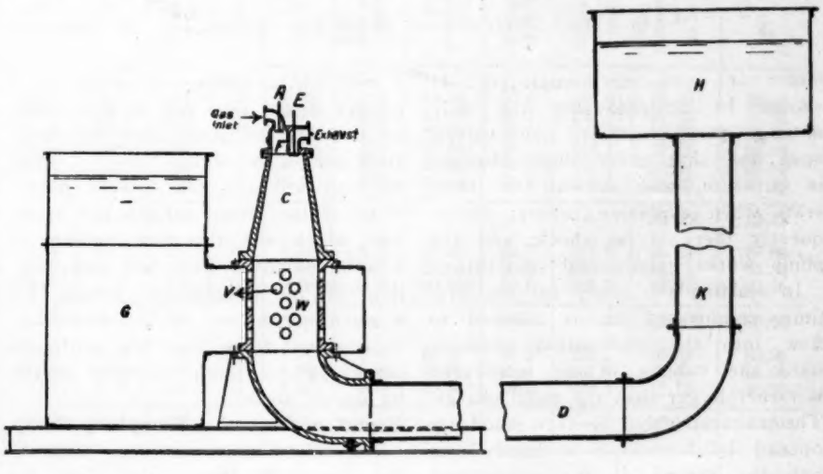



FIG. 2—DIAGRAMMATIC DRAWING OF HUMPHREY INTERNAL COMBUSTION PUMP.

*From *The Mechanical Engineer.*

that from which the last upward motion started, but the amount of combustible charge drawn in is slightly less than this movement would represent. Once more the column of water returns under the elevated tank pressure and compresses the charge of gas and air, which is then ignited to start a fresh cycle of operations.

The ignition is timed by a small apparatus somewhat resembling an ordinary engine indicator, which closes the electric ignition circuit at the point of maximum compression, and an ordinary small battery, trembler coil, and sparking plug, as used in motor-car work, are employed. It should be noticed that the only moving parts, namely, the valves, open and shut under slight changes in pressure, and are all on their seats when explosion occurs; consequently there is no shock, and the pump works quietly and smoothly.

In starting the pump for the first time, compressed air is allowed to flow into the combustion chamber until the volume of air introduced is rather larger than the usual charge. The exhaust valve is then suddenly opened by means of a hand lever and the escape of the compressed air permits a movement of the water column which gives the cushion and suction strokes and so draws in a fresh combustible charge, which, on ignition, starts the pump working regularly. If the pump is stopped when in regular work it always stops with a fresh charge of gas and air in the combustion chamber, and then the re-starting of the pump is simply effected by switching on the ignition current. The pump can therefore be started and stopped from a switchboard.

H. A. Humphrey, M. Inst. C. E., has also invented other types of pumps suitable for lifting water from a well or for delivering water to a greater height than can be dealt with by the type of pump just described; also pumps in which there is only one outward and one inward movement of the water column per cycle, and which are therefore known as 2-cycle pumps. The fuel consumption of the Humphrey pumps, for a given horsepower in the water lifted is stated to be less than with any other type of pump, whether driven by gas or steam.

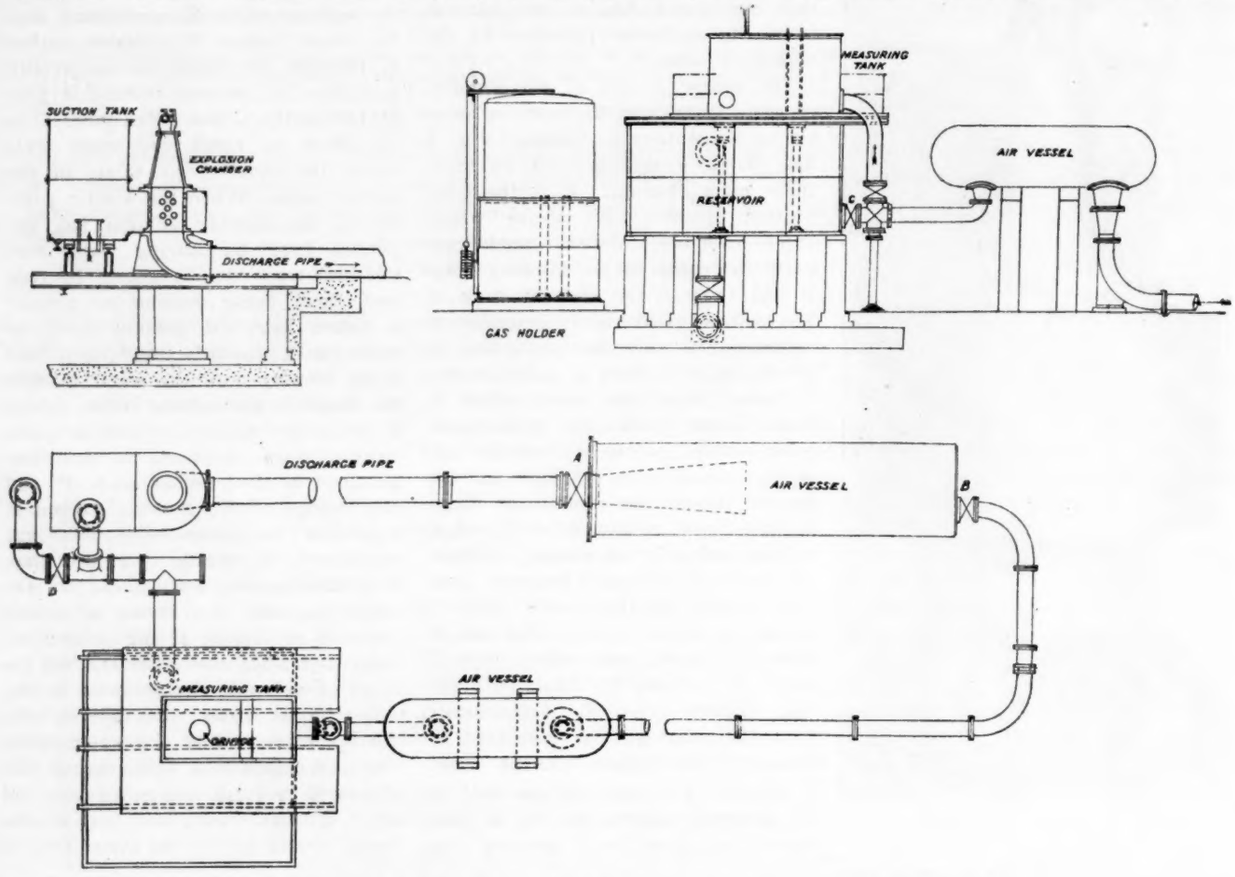



FIG. 3—HUMPHREY PUMP AND CONNECTIONS AS ARRANGED DURING THE TEST.

**Report of Test of a Humphrey Pump.**

The following report was made to the Pump & Power Co., Ltd., by Prof. W. C. Unwin:

Gentlemen, I attended at Dudley Port on Sept. 21 and 22 and made careful tests of the gas pumping arrangement of a completely new type which has been erected there. The pump is worked by the explosion of Mond producer gas supplied from the works at Dudley Port. The pressure due to the explosion of the gas acts directly on the mass of water to be pumped without any intervening mechanism. By an automatic action, due to the inertia of the mass of water, additional water is drawn in from the suction tank, a rebound occurs causing expulsion of the products of combustion, a second slighter flow during which a new charge is drawn into the explosion chamber, and a second rebound compressing the charge. Then ignition occurs and the process is repeated. Beyond the suction valves and the interlocking gear regulating the inlet and exhaust valves there are no moving parts or mechanism. The pump works absolutely automatically, without attention when once adjusted, and starts with a charge of compressed air with the greatest ease and certainty. Starting cold, an explosion occurred in five seconds, and the pump continued working regular-

ly. In these trials the ignition was effected by a small motor-car battery, and small "Reliance" motor-car igniting plug. The pump worked throughout the trials with varying lift without any change in the gas and air mixture or any alteration in the cushion volume. Also without a single misfire or hitch of any description.

The results are very remarkable. The fuel consumption in these trials, reckoned on the work done in lifting water, was less than in any pumping arrangement, either by gas or steam, hitherto recorded.

### Arrangement of Apparatus.

The arrangements for the trial were very satisfactory, and are shown in the drawing Fig. 3.

The gas was supplied from a gas holder, which during a trial was shut off from the gas main. The amount of gas used was determined from the fall of the gas holder during 10 or 12 minutes, the pressure and temperature being noted and the gas assumed to be saturated with moisture. The water in the gas-holder tank was maintained at the same level by securing a small steady overflow throughout the time of the trials.

The explosion chamber with its suction valves communicated with a discharge pipe 135 feet in length and 2 feet in diameter. This discharged into a very large air vessel. At the outlet from this was a sluice valve B, at which a man was stationed, opposite a pressure gage. By slight adjustments of the sluice he secured the maintenance of a nearly constant pressure in the large air vessel. The lift was measured by a mercurial siphon gage, one leg of which was connected to the suction tank and the other to the water in the large air vessel. The difference of level of the mercury columns is a direct measure of the height of the lift of the pump. The valve A was full open during the trials.

From the large air vessel the water passed through a second smaller air vessel to a measuring tank with stilling screens. In the bottom of this was a 9-inch sharp-edged orifice through which the water fell back into the water reservoir supplying the suction tank. The head over the orifice, taken at about 1½-minute intervals during a trial, afforded a means of determining the pump discharge. The valves C and D were closed throughout the trials.

The pump ran continuously during the morning and during the afternoon, the lift being maintained constant during the whole period of each series of tests. The tests were necessarily intermittent, as the gas holder required refilling at short intervals, the pump being connected directly to the gas main while refilling the gas holder. In the morning, with the greater lift, the duration of each test of the series was 10 minutes. In the afternoon, with smaller lifts, the duration of each test was 12 minutes.

I took the observations for gas consumption, and my assistant those for the lift and discharge. During each test samples of the gas were taken and analyzed by D. F. Twiss, B. Sc., of the Birmingham Municipal Technical School, and H. F. Pinnock, B. Sc., the works manager to the South Staffordshire Mond Gas Co. Some other observations, which do not affect the efficiency or economy, were made for me by Mr. Humphrey's assistant, Mr. Rusdell.

### Water Lifted.

The diameter of the horizontal orifice in the measuring tank was found to be 9 inches exactly by vernier caliper. Area of orifice, 0.4418 square foot. The position of the scale relatively to the orifice was found by leveling to be 0.02 foot too high, so that this correction has been added to the readings. The values of head over orifice for each test are the means of seven to nine observations during each trial, the pump running continuously and steadily both during the trials and the intervals between the trials.

The volume of discharge is calculated by the formula:—

$$Q = c\ w\ \sqrt{2gh} \text{ cubic feet per second.}$$
$$= 0.62 \times 0.4418 \times 8.0225\ \sqrt{h.}$$
$$= 2.197\ \sqrt{h.}$$

### Pump Horsepower.

The lift was observed on a mercury siphon gage, one leg of which comunicated with the suction tank of the pump, the other with the large air vessel into which the pump delivered. The density of mercury is taken at 13.59. The column of mercury which gives the difference of

| Trial number. | Mean lift in feet. | Head over orifice in feet. | Volume pumped. Cubic feet per second. | Volume pumped. Gallons per minute. | P.H.P. actual H.P. in water lifted. | Cycles per minute. | Gallons pumped per cycle. | Duration. | Fall of gasholder. | Gas pressure by water gauge. | Absolute pressure in inches of mercury. | Temperature of gas in deg. C. | Actual volume of moist gas used in trial. | Gas used per minute corrected to dry gas at 760 mm. and 0 deg. C. | Gas used per hour per P.H.P. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | min | ft. | in. | | | cub. ft. | cub. ft. | |
| I. .. .. | 32.91 | 3.90 | 4.339 | 1624 | 16.20 | 13.9 | 117 | 10 | 4.36 | 2·5 | 29.63 | 20.0 | 247.2 | 22.30 | 82.62 |
| II. .. .. | 32.80 | 3.77 | 4.267 | 1597 | 15.92 | 13.9 | 115 | 10 | 4.40 | 2.6 | 29.64 | 20.1 | 249.5 | 22.50 | 84.78 |
| III. .. .. | 32.84 | 3.82 | 4.293 | 1607 | 15.99 | 13.9 | 115 | 10 | 4.37 | 2.7 | 29.65 | 20.1 | 247.7 | 22.33 | 83.76 |
| IV. .. .. | 32.86 | 4.01 | 4.358 | 1647 | 16.39 | 13.7 | 120 | 10 | 4.40 | 2.9 | 29.66 | 20.1 | 249.5 | 22.51 | 82.38 |
| V. .. .. | 32.91 | 3.92 | 4.350 | 1629 | 16.24 | 13.7 | 119 | 10 | 4.32 | 2.7 | 29.65 | 20.1 | 244.9 | 22.08 | 81.60 |
| VI. .. .. | 32.81 | 3.90 | 4.339 | 1624 | 16.15 | 13.7 | 118 | 10 | 4.40 | 2.8 | 29.66 | 20.2 | 249.5 | 22.49 | 83.58 |
| Means .. .. | 32.87 | 3.89 | 4.331 | 1621 | 16.15 | 13.8 | 117 | — | — | — | — | — | — | 22.368 | 83.12 |
| VII. .. .. | 26.23 | 3.74 | 4.249 | 1591 | 12.64 | 12.1 | 132 | 12 | 4.32 | 2.8 | 29.66 | 20.7 | 244.9 | 18.35 | 87.08 |
| VIII. .. .. | 25.71 | 3.54 | 4.132 | 1547 | 12.05 | 11.8 | 131 | 12 | 4.41 | 2.8 | 29.66 | 20.7 | 250.0 | 18.73 | 93.24 |
| IX. .. .. | 25.92 | 3.61 | 4.174 | 1563 | 12.27 | 11.5 | 136 | 12 | 4.45 | 2.8 | 29.66 | 20.6 | 252.3 | 18.91 | 92.46 |
| Means .. .. | 25.95 | 3.63 | 4.185 | 1567 | 12.32 | 11.8 | 133 | — | — | — | — | — | — | 18.663 | 90.93 |
| X. .. .. | 20.54 | 4.43 | 4.625 | 1731 | 10.78 | 11.6 | 150 | 12 | 3.97 | 2.8 | 29.66 | 20.5 | 225.1 | 16.88 | 93.96 |
| XI. .. .. | 20.80 | 4.69 | 4.759 | 1782 | 11.23 | 11.2 | 159 | 12 | 4.09 | 2.8 | 29.66 | 20.4 | 231.9 | 17.40 | 92.96 |
| XII. .. .. | 20.84 | 4.45 | 4.636 | 1735 | 10.96 | 11.5 | 151 | 12 | 4.03 | 2.8 | 29.66 | 20.3 | 228.5 | 17.15 | 93.90 |
| Means .. .. | 20.73 | 4.52 | 4.666 | 1749 | 10.99 | 11.4 | 153 | — | — | — | — | — | — | 17.145 | 93.61 |

FIG. 4—TABLE SHOWING RESULTS OF TEST MADE ON HUMPHREY PUMP BY PROFESSOR UNWIN.

pressure at suction and delivery is partly balanced by an equal water column in the other leg. Hence $h$ feet of difference of level in the siphon gage correspond to $13.59h—h = 12.59h$ feet of water. The scale of the siphon gage was graduated to read feet of water, 1 foot division corresponding to 1/12.59 foot of mercury.

The pump horsepower for a discharge Q cubic feet per second and a lift of H feet is

P. H. P. = G. QH/550.
= 62.4 QH/550.
= .11344 QH

The lift was observed from seven to nine times in each trial, and the mean taken.

The temperature of the water pumped was 16 degrees C., and the density of the water 62.4 pounds per cubic foot.

### Gas Consumption.

The consumption of Mond gas was determined by noting the fall of the gas holder in a definite time. A test for leakage was made on Sept. 22, and the gas valves were found to be tight. The pressure in the gas holder was indicated by a water gage, and the temperature by a thermometer in the pipe leading to the explosion chamber.

The circumference of the gas holder was measured by a thin wire. Allowing for the plate thickness and wire diameter the internal diameter was 8.5 feet. Probably, allowing for rivet heads, stays, etc., this value is more likely to be slightly in excess than in defect, the error being unfavorable to the engine. The horizontal area of the gas holder is therefore 56.75 square feet. A rigid pointer moving over a well-graduated metal scale was used to determine the position of the gas holder.

### Gas Analyses.

The following tables give the consumption of the gas from the analyses by Mr. Twiss and Mr. Pinnock. From the analyses the calorific value per cubic foot has been estimated using these values, assuming the water vapor not condensed.

Net calorific values of dry gases burned at constant pressure, B. Th. U. per cubic foot at 0 degree C. and 760 mm. pressure.

| | |
|---|---|
| CO | 342.4 |
| $H_2$ | 292.3 |
| $CH_4$ | 963.0 |

### Heat Expenditure.

From the gas consumption (corrected to 760 mm. and 0 degree C.) and the corresponding calorific values, the total heat expenditure by the engine can now be calculated. For the purpose of comparison of this pump with pumps of other types, it is convenient to reduce the heat expenditure to the equivalent expenditure of standard anthracite. For the pressure of this reduction it is assumed that anthracite has a calorific value of 14,400 B. Th. U. per pound. Such coal used in a producer with an efficiency of 80 per cent (calculated on the assumption that the steam remains uncondensed) would give a quantity of producer gas of a calorific value of 11,520 B. Th. U. per pound of coal expended.

Hence, if in a trial $q$ cubic feet of Mond gas are used per hour per pump horsepower, the calorific value being $c$ B. Th. U. per cubic foot, the equivalent expenditure of anthracite in a producer would be:

$$\frac{q \times c}{11{,}520} \text{ lbs. per P. H. P. hour.}$$

### Pressure in the Explosion Chamber.

Mr. Rusdell was good enough to take an indicator diagram during each trial, and from these diagrams the following pressures have been obtained. The pressures are pressures above atmosphere.

| Trial number. | Gas used per P. H. P. hour, cu. ft. | Calorific value of gas B. Th. U. per cu. ft. Mean values from Twiss and Pinnock's analyses. | Heat expended per P. H. P. hour, B. Th. U. | Lbs. of anthracite in producer per P. H. P. hour. |
|---|---|---|---|---|
| I | 82.62 | 146.48 | 12,105 | 1.051 |
| II | 84.78 | 148.43 | 12,583 | 1.092 |
| III | 83.76 | 146.03 | 12,232 | 1.062 |
| IV | 82.38 | 145.49 | 11.985 | 1.040 |
| V | 81.60 | 151.23 | 12,340 | 1.071 |
| VI | 83.58 | 146.10 | 12,210 | 1.060 |
| Means | | | 12,243 | 1.063 |
| VII | 87.08 | 146.20 | 12,730 | 1.105 |
| VIII | 93.24 | 139.82 | 13,036 | 1.132 |
| IX | 92.46 | 144.33 | 13,344 | 1.158 |
| Means | | | 13,037 | 1.132 |
| X | 93.96 | 146.01 | 13,718 | 1.191 |
| XI | 92.96 | 145.80 | 13,553 | 1.177 |
| XII | 93.00 | 143.96 | 13,517 | 1.173 |
| Means | | | 13,596 | 1.180 |

| Trial number. | Average compression pressure, Lbs. per sq. in. | Average explosion pressure, Lbs. per sq. in. |
|---|---|---|
| I | 44.3 | 101.0 |
| II | 45.5 | 102.0 |
| III | 44.5 | 89.0 |
| IV | 46.0 | 105.0 |
| V | 45.7 | 100.7 |
| VI | 42.3 | 102.7 |
| Means | 44.7 | 100.1 |
| VII | 33.7 | 85.0 |
| VIII | 32.0 | 71.0 |
| IX | 34.0 | 82.7 |
| Means | 33.2 | 79.6 |
| X | 18.0 | 87.5 |
| XI | 20.3 | 86.3 |
| XII | 21.0 | 85.3 |
| Means | 19.8 | 86.4 |

### General Conclusions.

The Humphrey internal-combustion pumping arrangement is remarkable for its simplicity. It consists of simple mushroom suction exhaust and inlet valves, with a light interlocking gear connecting the inlet and exhaust valves, and a small and simple electrical ignition apparatus. The action of the interlocking gear is automatic, being effected entirely by the pressure changes in the explosion chamber. The mechanism present in all other pumps, with its frictional waste of work, is absent. The absence of mechanism and attendant friction and wear, so that there is no need of lubrication except for the very small and light interlocking gear, must have the consequences that the apparatus is exceedingly durable and the working expense extremely small. There can be no gradual loss of efficiency such as in ordinary engines arises from piston wear and consequent leakage. As all parts of the explosion chamber are washed by water every cycle, there is no possibility of pre-ignition troubles. Also the temperature of all the metal is kept low by internal water cooling, and difficulty from expansion and contraction is eliminated. The maximum lift appears to depend solely on the length of the discharge pipe. The pump works at lower lifts automatically without any change, and with no considerable change of efficiency.

It might seem likely that, as the explosion takes place directly on the surface of the water, the water would be sensibly heated. This, however, is not the case; most of the heat generated disappears in the exhaust, and the part communicated in the water is quite small. In these trials the water circulated round, being continually repumped; in the course of an hour the temperature in the storage tank did not rise one degree Cent.

The fuel economy is very striking, and, so far as I know, unequaled by any other pumping arrangement. The following is a summary of the gas and heat expenditure:

| Lift, feet. | P. H. P. | Mond gas used per P. H. P. hour at 760 mm. and 0° Cent., cu. ft. | Calorific value of gas per cu. ft. in B. Th. U. | Heat expended per P. H. P. hour Th. U. | Lbs. of anthracite in producer per P. H. P. hour. |
|---|---|---|---|---|---|
| 32.87 | 16.15 | 83.12 | 147.3 | 12,243 | 1.063 |
| 25.95 | 12.32 | 90.93 | 143.5 | 13,037 | 1.132 |
| 20.73 | 10.99 | 93.61 | 145.3 | 13,596 | 1.180 |

An ordinary gas engine of three times this power, and using similar gas, would use at full load 72 cubic feet to 84 cubic feet of gas per brake horsepower, and 95 cubic feet to 100 cubic feet at half full power. If set to drive any form of pump, the gas consumption reckoned on the pump horsepower would be considerably greater. The Humphrey pump when lifting water works with about the same economy as a gas engine driving itself only.

### Comparison of the Humphrey Pump with a Gas Engine Driving a Centrifugal Pump.

Suppose a gas engine driving a centrifugal pump required to do 16 pump horsepower, on a lift of 33 feet, or the same work as the Humphrey gas pump tested. On such a lift the efficiency of the centrifugal pump would certainly not exceed two-thirds, and might be rather less. Hence the gas engine would have to supply in normal working 24 boiler horsepower at the pump shaft. Gas engines will not work with an overload, and, to be safe, it would be desirable and usual to have a gas engine of 32 maximum horsepower, which, in normal work, supposing the efficiency of the pump to be assumed, would develop three-quarters of maximum power. So working, it would require 80 cubic feet to 85 cubic feet per hour of gas of the quality used in the preceding trials for each brake horsepower. Hence it would require 80 × 24 to 85 × 24 or 1,920 to 2,040 cubic feet per hour. The comparison stands thus, therefore: Gas engine and centrifugal pump, 120 cubic feet to 127 cubic feet of gas per pump horsepower hour; Humphrey gas pump, 83.1 cubic feet of gas per pump horsepower hour.

Working with less load the comparison would probably be more favorable to the Humphrey pump, because as the lift decreased the efficiency of both the gas engine and the centrifugal pump would diminish.

### Comparison of the Humphrey Pump with a Steam Pump.

Small steam pumps are notoriously inefficient and wasteful of fuel, and a comparison with them would be useless. But to show how remarkable the fuel economy of the Humphrey pump is, it may be compared with large steam pumping engines of the highest class.

Some years since I made careful and complete tests of a pair of compound and a pair of triple-expansion engines at the West Middlesex water works. The engines were high-duty Worthington engines, of exceptionally low steam consumption, with boilers which gave a high evaporative efficiency with picked Welsh coal.

The following statement shows that these fine steam engines, with the advantage of much greater lift, did not approach in economy the Humphrey gas pump. The compound engine required twice as much coal per pump horsepower as the Humphrey pump:

| | High Duty Worthington Engines. | | | |
|---|---|---|---|---|
| | Compound, Nov., 1888. | Triple, Dec., 1896. | Triple, Feb., 1897. | Humphrey gas pump, Sept., 1909. |
| I. H. P..... | 255.5 | 370.5 | 498.4 | ..... |
| P. H. P..... | 217.1 | 320.3 | 449.8 | 16.15 |
| Lift in feet.... | 53.7 | 92.3 | 129.1 | 32.9 |
| Quantity pumped in gals. per min. | 13,407 | 11,450 | 11,497 | 1,621 |
| Coal per I. H. P. hour ..... | 1.696 | 1.402 | 1.530 | ..... |
| Coal per P. H. P. hour ..... | 1.996 | 1.622 | 1.695 | 1.06 |

In the case of the compound steam engine the expenditure of heat in the boilers was 494 B. Th. U. per minute per pump horsepower. The corresponding expenditure in a producer for the Humphreys gas pump would be 250 B. Th. U. per pump horsepower minute.

I have the honor to be, Gentlemen, Your obedient servant,

(Signed)

WILLIAM CAWTHORNE UNWIN.

## TWENTY-FIVE YEARS OF ENGINE BUILDING.

The building of steam engines, at least in the United States, is not of such antiquity but that a concern which has carried on the business for 75 years without interruption may justly claim to have been a pioneer and feel a pardonable pride in its growth and present virility.

In an exquisite little bit of book-making the C. & G. Cooper Co., Mt. Vernon, O., briefly relates the history of the concern from its inception in 1833 down to the present time; so briefly and interestingly in fact that it merely excites a desire for more. Not the least instructive and entertaining feature of the chronicle is the story without words told by a comparison of the views of the early and latter day productions of the Cooper shops. Among the former is to be noted the geared horizontal blowing engines of old Jefferson furnace, illustrated in THE IRON TRADE REVIEW, Aug. 5, 1909. The locomotive also received a share of attention in early days and that "modern" development known as the "Atlantic" type will be found after all to have had its prototype in 1853. The big rolling mill engine and the strictly modern gas engine exemplify present practice.

The value of congenial surroundings and their influence upon contentment and pleasant relations between employer and employe as well as on the engine building are given full weight. Mt. Vernon is certainly beautifully situated, the inducements to permanent residence are many and powerful and the policy of the company towards its employes is liberal in the extreme. One of its features is the payment of 6 per cent interest on employes' savings left with the company, which virtually amounts to constituting every thrifty workman a preferred stockholder without the risk of depreciation. It must be satisfying in the extreme to the company to be able to say: "In looking back over these years it is gratifying to realize that our customers have been satisfied, and have continued their friendly relations. These relationships have been no small part of the compensating pleasure of doing business. The sons and grandsons of our original patrons of two and three generations ago are among our present customers."

The portraits, the illustrations and the presswork place the work entirely beyond a suggestion of the catalog and entitle it to a place in the library. THE IRON TRADE REVIEW extends congratulations and best wishes for continued growth and prosperity.

## POLYGLOT OF IRON AND STEEL CLASSIFICATIONS.

The following table should have appeared in THE IRON TRADE REVIEW of Nov. 11, in connection with the report on "The Uniform Nomenclature of Iron and Steel," adopted at the meeting of the International Association for Testing Materials, held at Copenhagen in September, but was crowded out for lack of space. It con-

| NAMES | | | | | | | |
|---|---|---|---|---|---|---|---|
| English | French | Italian | Spanish | German | Swedish | Danish | Dutch |
| SPECIES. | | | | | | | |
| Cast iron | Fonte | Ghisa | Fundicion de hierro | Roheisen if not remelted, Gusseisen if remelted | Tackjern Gjutjern | Raajern naar detikke er omsmeltet eller Stobejern | Gietyzer (ruwyzer) |
| VARIETIES. | | | | | | | |
| White cast iron or pig iron | Fonte blanche | Ghisa bianca in pani, Ghisa bianca | Lingote de hierro blanco y fundicion de hierro blanco | Weisses Roheisen | Hvitt tackjern | Hvidtjern | witgietyzer (witruwyzer) |
| Gray cast iron or pig iron | Fonte grise | Ghisa grigia | Lingote de hierro gris y fundicion de hierro gris | Graues Roheisen | Gratt tackjern | Graatjern Graat Raajern | Grauw gietyzer |
| Mottled cast iron or pig iron | Fonte truitee | Ghisa trotata | Lingote de hierro truchado y fundicion de hierro truchado | Halbiertes Roheisen | Hagelstatt or Halfhwitt or halfgratt tackjern | Spragletjern | wit korreligietyzer |
| Pig iron (white, gray, mottled, etc.) | Gueuses de fonte ou fonte en gueuse | Ghisa | Lingote de hierro | Gusseisen Roheisen (in Masseln oder Gansen), Gusseisen (weiss, grau, halbiert) | Tackjern | Pigjern or Raajern | Ruwyzer (gemeleerd) |
| Hot metal, or direct metal | Fonte de premiere fusion? | Ghisa da prima fusione liquida | Metal caliente o metal directo | Remeisen Roheisen, Gusseisen erster Schmelzung | Tackjern direct gjutet fran Masugnen | Smeltet Raajern | Ruwyzer cerste gieting |
| Basic cast iron or pig iron | — | Ghisa basica in pani | Lingote de hierro basico | Thomasroheisen | — | Thomas Raajern | Thomas ruwyzer |
| Hematite cast iron or pig iron | — | Ghisa ematite in pani | Lingote de hierro hematites | Hamatitroheisen | — | Haematit Raajern | Haematit ruwyzer |
| Malleable pig iron | — | Ghisa per affinazione | Lingote de hierro para fundicion maleable | Schmiedbares Gusseisen | — | Hammerbart-Stobejern | Smeedbaar gietyzer |
| Washed metal | Fonte epuree | Metallo defosforato | Fundicion de hierro refinada o lavada | Entphosphortes Roheisen | Tvattad | Affosforet Raajern | Onthospherd gietyzer |
| Refined cast iron | Fonte mazee | Ghisa affinata | Fundicion de hierro refinada o depurada | Gesseintes Eisen | Raffineradtjern | Raajern til Hardfriskning | Gezuiverd gietyzer |
| Charcoal hearth cast iron | Fonte mazee | Ghisa al carbone di legna | Fundicion refinada al carbon vegetal, en fuego de afineria | Herdfrischeisen Holzkohlen Herdfrisch-Roheisen | Tackjern for hardfarskning | Raffineret Raajern | Houtskolen gietyzer |
| Alloy cast iron | Fontes speciales | Lega di ghise (ghise speciali) | Aleaciones de hierro colado | Sondergusseisen | Special tackjern | Special Raajern | Special gietyzer |
| SPECIES. | | | | | | | |
| Malleable castings | Fonte malleable | Pezzi fusi (getti) di ghisa malleabile | Piezas de fundicion de hierro maleable | Schmiedbares Gusseisen or schmiedbarer Guss. | Aduceradt jern | Hammerbart Stobejern, Hammerbart Stobegods | Smeedbare gieting |
| SPECIES. | | | | | | | |
| Steel | Acier | Acciaio | Acero | Stahl | Stal | Staal | Staal |
| VARIETY A. | | | | | | | |
| **Called steel because cast initially into a malleable mass. 1. Soft or low carbon steel, or ingot iron.** | Acier doux, acier extra doux, fer fondu | Lingotto di ferro omogeneo (acciaio dolce) | Hierro fundido | Flusseisen[1]) | Gotmetall | Staal Blodstaal | Smeltyzer Vloeiyzer |
| **2. Half hard and hard, or medium and high carbon steel, or ingot steel** | Acier fondu, acier mi-dur, acier dur | Lingotto d'acciaio, duro, semi-duro | Acero fundido | Flussstahl[1]) | — | Haardtstaal | Vloeistaal |
| SUB-VARIETIES. | | | | | | | |
| Bessemer steel | Acier Bessemer | Acciaio Bessemer | Acero Bessemer | Bessemer-Flusseisen Bessemer-Flussstahl | Bessemerstal | Bessemer staal | Bessemer staal |
| Open-hearth steel | Acier Martin Siemens, acier sur sole | Acciaio Martin | Acero de Solera | Flammofen-Flusseisen Flammofen-Flussstahl | Martinstal | Martinstaal | Frischstaal, Siemens-Martinstaal |
| Crucible steel | Acier au creuset | Acciaio al crogiuolo | Acero de crisoles | Tiegelflusseisen Tiegelflusstahl | Degelstal or Degelgjutstal | Digelstaal | Kroerzenstaal |
| Cast steel | Acier au creuset | Acciaio fuso | Acero fundido | Gussstahl | Gjutstal | Stobestaal | Gietstaal |
| Steel castings | Moulages d'acier | Pezzi di acciaio colato | Piezas de acero colado | Flusswaren | Stalgjutgods | Staalstobegods, or Facongods | Vormgietstaal |
| VARIETY B. | | | | | | | |
| **Weld steel, or wrought steel called steel because it is capable of hardening greatly by sudden cooling** | Fer fort ou fer dur | Acciaio saldato Acciaio fucinato | Acero Soldado | Schweissstahl or Schweisseisen[1] | Wall stal, rarely used, no equivalent | Svejsestaal | Welyzer Welstaal |

| NAMES | | | | | NAMES | | |
|---|---|---|---|---|---|---|---|
| English | French | Italian | Spanish | German | Swedish | Danish | Dutch |
| SUB-VARIETIES. | | | | | SUB-VARIETIES. | | |
| Blister steel, aslo called cemented and converted steel | Acier poule, acier cemente, acier de cementation | Acciaio cementato Acciaio al crogiulo Acciaio a carburazione esterna cementato | Acero cementado | Zementstahl | Blasstal, Brannstal, Cementstal | Blaerestaal or Cementstaal | Cementstaal |
| Shear steel | Acier rafine une fois corroye | Acciaio damascato (acciaio saldato) | — | Schweissstahl | — | Svejsestaal | Welstaal |
| Puddled steel | Acier puddle | Acciaio pudellato | Acero Pudelado | Puddelstahl | Puddelstal | Puldclstaal | Puddelstaal |
| VARIETY C. | | | | | VARIETY C. | | |
| Alloy steels | Alliages a base de fer, aciers speciaux | Lega di acciaii (acciai speciali) | Aleaciones de Acero | Sonderstahl | Special stal | Special staal | Specialostaal |
| SPECIES. | | | | | SPECIES. | | |
| Wrought iron (or weld iron, or, in Great Britain, malleable iron) | Fer soude | Ferro fucinato Ferro saldato | Hierro forjado Hierro soldado | Schmiedeisen and Stabeisen | Smidesjern Lancashire jern | Svejsejern | Welyzer |
| VARIETIES. | | | | | VARIETIES. | | |
| Puddled iron | Fer puddle | Ferro pudellato | Hierro pudelado | Puddeleisen | Puddeljern | Puddjern | Puddelyzer |
| Bloomary or knobbled iron | Fer au bois (obtenu au Bas-Foyer) | — | — | Herdfrischeisen | Lancashire Franche-Comte or Walloon jern | Haerd frisket jern (always refers to Lancashire iron from Sweden) | Puddel of frischyzer |

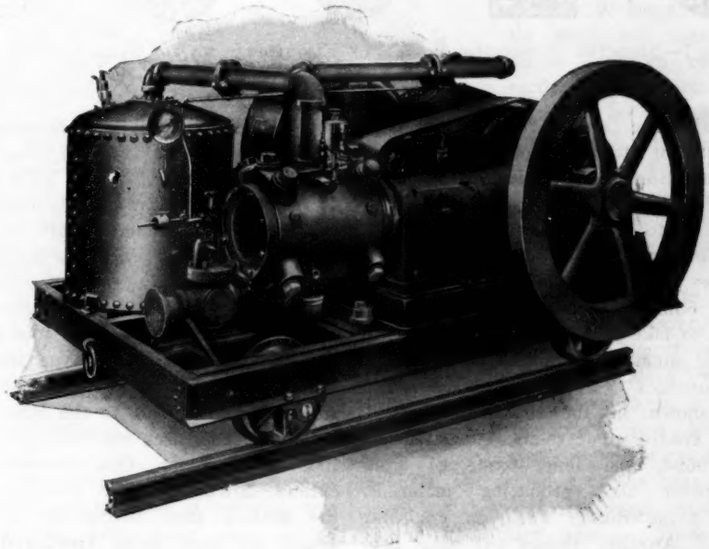
[1] According to Wedding cast metal having a tenacity greater than 50 kg. per sq. mm. should be called Flussstahl, while with a smaller tenacity it should be called Flusseisen. Weld metal with a tenacity exceeding 42 kg. per sq. mm. should be called Schweissstahl and with a less tenacity, Schweisseiser.

sists of a polyglot, in English, French, Italian, Spanish, German, Swedish, Danish and Dutch, of the chief classes of iron and steel. The list is not intended to be complete, but rather to include only those varieties which are of interest to the Association.

## A PORTABLE AIR COMPRESSOR.

There are many cases, particularly in mining service, where compressed air might be used to advantage, were it practicable to carry pipe lines to the various points of application. In many instances, however, the workings are remote and inaccessible, rendering this impossible, although electric wires might readily be brought up to the working face or point of application. Instances are the use of rock or hammer drills, the operation of coal-pick machines, etc. Another notable instance aside from mining operations, is the use of pneumatic tools in structural work. An air compressor for special service such as has been described has recently been designed by the Sullivan Machinery Co., Chicago, Ill., and the form shown in the accompanying cut is intended primarily for mining work. The outfit consists of a standard single stage compressor driven by a chain from an electric motor. The whole outfit is mounted on a truck made to fit the gage of the mine track. The working parts are enclosed in an iron housing, and the splash method is used for lubrication. This machine differs from the Sullivan standard belt-driven machine in that a sprocket or gear for the chain drive replaces the pulleys used with a belt-driven machine. The automatic inlet and discharge valves, which are of the poppet type, are easily removable for inspection and cleaning. The air cylinders and heads are waterjacketed, the cooling water being supplied by a pump mounted on a truck which is driven by chain and sprocket from the compressor crank shaft. The water supply is drawn from any convenient source, usually tanks or barrels mounted on a mine car. The air inlet opening is covered with a screen to prevent foreign substances from entering the air cylinder, and an unloading device is attached to this opening, arranged so that whenever the air pressure in the receivers reaches the desired limit the supply of air is shut off, which cuts down the amount of power used.

The motor is of the shunt-wound continuous current pattern, and may be arranged for any desired voltage with either direct or alternating current, and is fitted with the necessary



PORTABLE AIR COMPRESSOR: SULLIVAN MACHINERY CO., CHICAGO.

switches, rheostat and fuse connections. Two receivers, instead of one, connected in series are employed in connection with this machine to permit of compactness of arrangement and to reduce the height of outfit. A compressor of this type with a 10 x 12-inch air cylinder furnishes about 175 feet of free air per minute, running at 150 revolutions per minute. The necessary horsepower for such a machine is about 25, at which an air pressure of 80 pounds is easily maintained in the receiver. This capacity is ample to operate a coal-pick machine or two small reciprocating rock or several hammer drills or pneumatic tools. The motor and compressor are bolted to the cast iron sub-base, which in turn is bolted to a structural steel frame mounted on the trucks. In case mine or industrial track is not available, wheels with wide tires may be substituted for those with flanges, and the outfit hauled from place to place on the floor or ground. For bridge construction or other railroad service the frames may be bolted to a standard flat or gondola car.

## THE PERKINS PROCESS FOR PRODUCING AND REFINING STEEL

A patent bearing the title "A Process for Producing and Refining Steel," and closely affecting the electric arc processes now in use, was recently granted Frank C. Perkins, consulting electrical engineer, of Buffalo.

With very few exceptions the electric furnace processes now in successful operation, or in a promising experimental stage, are of Swedish, French, German or Italian origin, and the patent mentioned above is therefore interesting because it represents an advance into this important field by an American inventor.

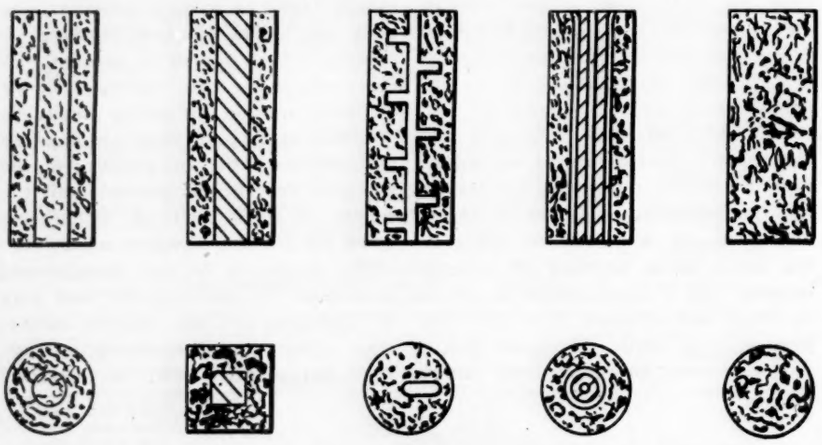


FIG. 1—SHOWING SUGGESTED FORMS OF ELECTRODES TO BE USED IN ORDINARY ARC FURNACE.

The process depends upon the use of a composite or combination electrode to take the place of the usual carbon or metal electrode in the ordinary arc furnaces. Several suggested forms are shown in the drawings, Fig. 1 Two consist of carbons, either equare or round, and lime, oxide of iron, or other slag producing materials, with some binder such as coal tar pitch. Another shows the slag producing materials packed in an iron or steel pipe, and still others show the slag materials surrounding a carbon or steel rod either with or without projections for supporting them.

It is claimed that by the use of these special electrodes fresh and additional slag refining materials may be added to the bath of metal both fused and in a highly fluid condition, at the hottest points, namely the arcs. These are the points of contact between the electrodes and the layer of slag floating on the bath of metal. The slags so produced are said to be capable of very quick and efficient work.

Many ways of using these electrodes are possible, and they are applicable to the existing types of arc furnaces. When two of them are used in a furnace of the double pole type the current passes from one electrode into and through the slag to the other electrode, the two arcs operating at about 100 volts pressure. One electrode may extend down into the slag, or into the molten steel below the slag, a single arc only being employed with a pressure of approximately 50 volts. A double pole furnace, such as the Heroult, is well adapted for working with these compound electrodes, the number of arcs being under control. If one arc only is used, the other electrode may be raised and lowered by suitable mechanism, thus keeping the molten bath agitated.

When only one electrode is to be used, a method similar to the Girod may be employed, the current passing in an arc from the electrode to the slag, then through the slag and the metal, and through an electrode or electrodes in the bottom of the furnace.

One method wherein the use of the electrodes seems promising is to use a basic lined ladle, without a cover, as shown in Fig. 2. The metal having been charged from a Bessemer converter or open hearth furnace is electrically refined for the removal of sulphur, phosphorus and gases. If necessary, it is de-oxidized and recarburized. The steel is then poured into ingots after an operation lasting from a few minutes to an hour or more, depending upon the degree of refining desired.

Another suggested method is shown in Fig. 3, where what may be called a ring electrode is arranged on a level with the slag. A single arc only is used, the other electrode dipping into the slag or molten steel.

The special field of this new electrode is claimed to be its application to refining processes. It is well known that in the acid Bessemer process the quality depends almost entirely on the metal, it being impossible to eliminate the sulphur and phosphorus. The carbon, manganese and silicon can readily be controlled and kept uniform, but the other elements depend upon the charge. By the arc process the blown Bessemer metal can be refined, and the sulphur and phosphorus lowered to any desired extent.

The determining factors in these refining processes are cost and output. By shortening the time of treatment, through the use of these combined electrodes and refining down only to such phosphorus and sulphur percentages as are essential for rails and

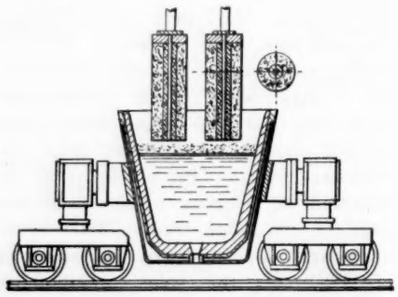


FIG. 2—ELECTRODES USED WITH LADLE.

structural steels, the small power requirements and the output make it a practical process.

With the proposed electrodes containing slag-producing materials it should be possible to lower the phosphorus to 0.03 or 0.05 within a short time, and so bring the process within practical limits for Bessemer working.

It is also, of course, applicable to open hearth metal, and stress may be laid upon the degree of de-oxidation which may be obtained. Materials can be used in the electrodes, and added to the bath to make a neutral slag,

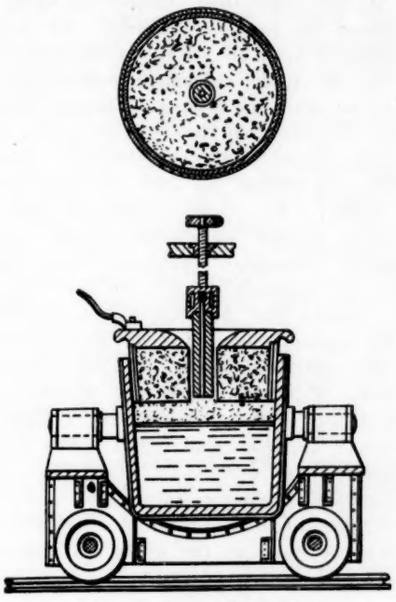


FIG. 3—RING ELECTRODE.

for it is maintained that a thorough de-oxidation of the steel is not possible when there are oxides of iron in the slag, the oxides reacting with the bath of molten steel.

By means of these electrodes, and the arc process, carbon or a mixture of carbon and iron may be added to the neutral slag as an auxiliary to the carbon of the electrode, forming calcium carbide and resulting in de-oxidation without difficulty and at a small cost. The neutral slag electrodes may be worked with a low current arc, or by dipping into the slag and heating by resistance, and the steel may be kept for hours under its covering of molten neutral slag without changing in quality. In short it would seem that the manifold advantages of electrical refining apply with even greater force to processes using these composite electrodes.

The cost of production of the steel will be low, for most of the work is done in the Bessemer or open hearth.

## THE AMSLER IMPROVED HOT BLAST STOVE.

This stove is of the three pass central combustion chamber type. Fig. 1 shows a vertical section and Fig. 2 shows a horizontal section at different

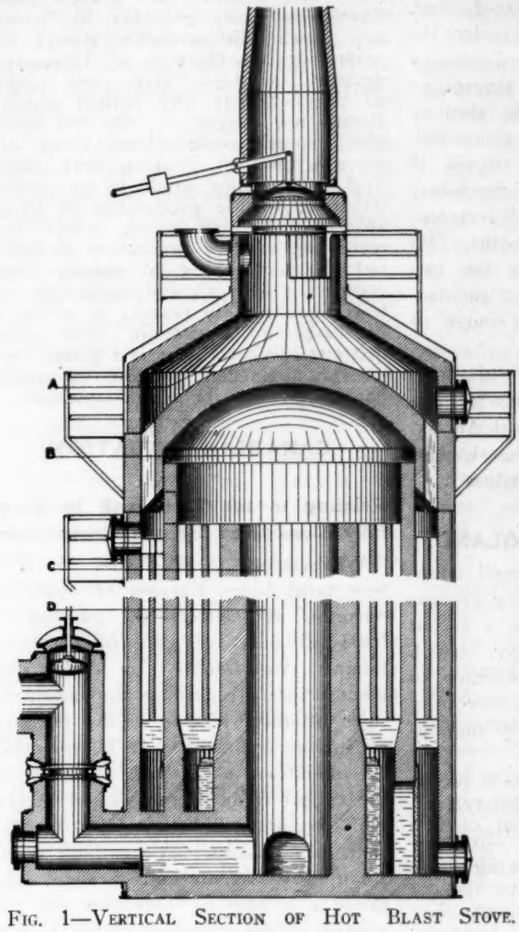



FIG. 1—VERTICAL SECTION OF HOT BLAST STOVE.

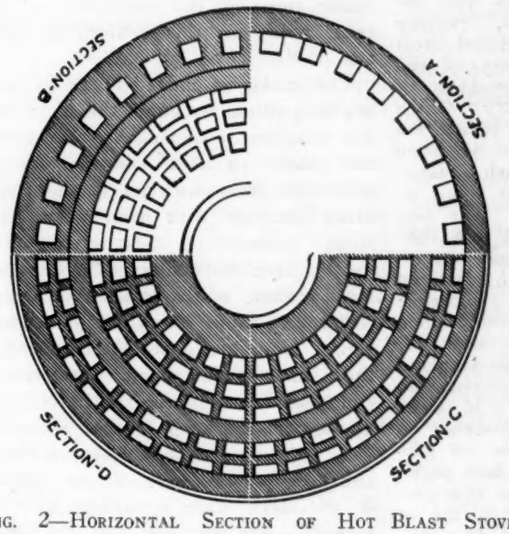



FIG. 2—HORIZONTAL SECTION OF HOT BLAST STOVE.

places as marked. It will be evident that the English crown is retained only so far that very short and vertical flues are required through it, and the inner or combustion chamber and the intermediate wall are allowed to expand and contract by themselves, the latter making a slip joint in the crown.

The stove consists of the usual air tight steel shell with cold blast and gas inlets and hot blast and chimney outlets, cleaning doors, etc. The masonry is arranged in three vertical cylindrical walls with checker work between them, so laid that they are entirely separate from each other. The two inner cylinders are open at the top but the outer one is provided with a double dome with vertical flues through the lower one to the passage between the domes. This passage leads to the chimney. The intermediate wall is extended up to make a slip joint with the lower dome by means of the recess there provided. The checker work in the passes is built independently of the walls but is very substantially bound together.

This construction permits of several very important improvements. The intermediate wall having no weight but its own to carry is made lighter and permits of increased heating surface in the same diameter of stove. The thrust of the dome on the inner wall of the old design is done away with. The dome is carried on the outer wall so that it bears against the shell and the arch thrust is taken up directly by the metal instead of being transmitted through the checker work of the outer pass. This prevents the abrasion and tendency to crumble at this point in the old design.

It is possible to construct the masonry for this stove almost entirely of standard 9-inch shapes, which is a very important item in the cost of construction.

There are provided at the base of the stove radial walls in the space under the second and third passes. These are built up to the checker work and insure an even distribution of the descending gasses to the third or outer

pass. This prevents the formation of hot flues in the third pass which rob the colder ones of the hot gas and produce the trouble known as a "hot side".

Another improvement in detail is the manner of introducing the cold blast. This is introduced directly under the chimney valve and is directed upon a cast iron baffle plate at a tangent so that the force of the blast is taken up and erosion of the masonry is avoided.

There are three of these stoves 18 feet by 75 feet successfully furnishing hot blast for a 17 feet by 75 feet furnace in the southern Ohio district. This plant has been in operation for two years and is giving excellent satisfaction. A similar plant is in course of erection in the same district.

Walter O. Amsler, D. Sc., of Pittsburg, the designer and patentee of this stove, is a son of the late Carl Amsler, one of the pioneer metallurgical engineers in the iron and steel industry.

## BASIC STEEL IN ENGLAND.

A plea for the more general adoption of the basic steel making process in Great Britain is made in a recent editorial of *The Ironmonger*, which sees in this field an opportunity to compete with Germany on many lines of steel products now largely monopolized by the latter.

Basic steel making is quite a recent development of Sheffield industry, and the steadily increasing output of this material indicates that its suitability for many purposes is becoming more and more recognized, and that the old prejudice against it is dying out. The successful competition of Germany with Great Britain in ship and engineering forgings, plates, railway axles and tires, and cold-rolled steel is due mainly to the ability of the Germans to make these products of basic steel of a quality which satisfies Lloyds or the Board of Trade inspectors. This is one instance in which British manufacturers have allowed their rivals to steal a march upon them. The fact should, of course, be taken into consideration that Germany possesses an abundance of ores suitable for making basic iron, and that the experience of the German makers enables them to deal with these to the best advantage, while many users in England of such goods as those enumerated have persistently specified acid steel. The failure of early experiments in the application of basic steel to purposes for which acid steel had previously been used accounts for this prejudice, but since then the advance of metallurgical practice has made possible many things which were formerly impracticable, and has shown that the cheaper material offers a reliable substitute for the more expensive product in several directions.

Sheffield and the North of England have lost much work through being undersold by the Germans with steel made from a cheaper class of iron than is used here, but the output of basic steel in Sheffield is likely to be considerably increased during the next few years, and its more extended adoption will benefit our home trade. There are many purposes for which acid steel will probably always be preferred; but there is an increasing demand for basic steel, and really no reason exists why British makers should not supply it. On the other hand, some people whose views deserve attention consider that Sheffield's best policy would be to confine its trade to the production of those special and high grade steels for which it enjoys a reputation throughout the world, and to abstain from competing with all and sundry in the lower qualities, in respect of which it possesses no advantage over other districts. Where price is a prime consideration Sheffield is often seriously handicapped by its inland situation.

## CANADIAN SITUATION

### Relating to the Tariff will be Carefully Considered by the Commission.

Washington, D. C., Nov. 15.—The new tariff board has settled down to business, and letters are pouring in from all parts of the country containing expressions by exporting manufacturers regarding the treatment their products receive in the markets of foreign countries. It is said that the situation in Canada, as affecting the export trade of the United States, is likely first to be considered. Recent negotiations between the Canadian government and France may produce conditions requiring the attention of the president of the United States touching the application of the tariff policy of this country to Canada.

The claim is made by those who are in position to know the facts that the relations of Canada and her tariffs and trade to this country contain more complications than those of any other country with which we have large commercial dealings. The variety of plans contained in Canada's trade policy, under which she makes reciprocal trade arrangements which depart from her general tariff, and at the same time grants preferential concessions to Great Britain, the mother country, produces situations that will require the closest scrutiny and care on the part of our officials if President Taft is to be able to proceed upon correct lines in applying our tariffs to the Dominion.

No line of American exports would be more directly and immediately affected by tariff differences between the United States, Canada and France than the iron and steel industry. Canada and France now have pending a reciprocal agreement, which France has approved, and which Canada is expected soon to adopt, which gives Canadian manufacturers exceptional advantages in French markets—advantages which American exporters, probably under no circumstances, as they will stand according to the terms of our new tariff, can obtain.

Canada as well as France is a large purchaser of iron and steel, in various forms, both raw and manufactured. Throughout British North America there are new and thriving industries which draw heavily upon the United States for materials of various knds. At the same time, Canada is struggling to find new markets for her finished products. This is the reason for the trade agreement now sought to be made by Canada, whereby better facilities will be secured for placing agricultural implements and kindred wares in the markets of France. To some extent, at least, these exports by Canada would displace American products in the French markets.

During the first three-quarters of the present year, Canada took more than $800,000 worth of rails; more than $1,200,000 worth of structural iron and steel and more than $250,000 worth of billets and ingots. The aggregate of our sales of wire and builders' hardware during the period in question to Canada and other British provinces at the north was more than $3,000,000 worth.

In view of the fact that the issue raised over the Franco-Canadian trade arrangement involves the matter of sales in French markets of agricultural machinery, it is well to note the recent figures regarding this trade.

We have sent to France during the first nine months of the present year about $3,500,000, the largest sales to any one country save Russia and Argentina. To Canada we sold about $2,200,000 worth of such implements.

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The Latrobe Foundry Co., and the Baltimore Foundry Co. have been merged under the name of the Baltimore Foundry Co., with a plant at Bush and Severn streets, Baltimore. The company will make a specialty of structural iron castings, and is prepared to turn out heavy machine castings up to 20 tons. The officers of the company are: President, Ferd. C. Latrobe Jr.; vice president and general manager, John C. Shane; treasurer, John L. Bailey.

# NEWS FROM MANY INDUSTRIES

**(In order to assist the post offices in delivering letters to new concerns, it is suggested that the names of incorporators be written in the lower left hand part of every envelope addressed to such new companies.)**

**New Buyers:—**

The following manufacturing companies filed articles of incorporation:

The Vivon Fence Co., Moberly, Mo.; $100.000; by D. R. Vivon, W. A. Vivon, D. M. Simpson and others.

The Morrisburg Tack Co., Ltd., of Morrisburg, Ont., capital $40.000; by Wm. Eager, George N. Hickey, Andrew Broder and others.

The Southern Steel Casting Co., Chattanoga, Tenn.; $100,000; by John D. Key, Charles N. Fox, C. G. Miligan.

The Cambridge Machine & Foundry Co., Cambridge, O.; $5,000; by S. T. Smith, A. L. Smith, John Gilcher, Bertha Gilcher and E. M. Johnston.

The Corrugated Culvert Co., Moberly, Mo.; $30,000; by Harvey G. Saffer, Moberly, Edward R. Pyle and John E. Pyle, Emporia, Kans.

The Reliable Machine Co., Cleveland; $10,000; by James A. Garvey, John W. Garvey, Metes F. Ryan, William G. Batchelder and John L. Dowling.

The Electro-Steel Co. of Canada, capital $100,000, with head office at Toronto, to treat mineral ores by electricity or otherwise.

American Electric Machine & Elevator Co., St. Louis, Mo.; $10,000; by John F. Burke, William A. Knauss, and John W. Fierce.

The Builders' Iron & Steel Co., St. Louis, Mo.; Charles E. Collet, F. Edward Sudholt and Henry G. Marquardt; $2,000 capital stock.

The Madill-Shroyer Engine Co., St. Louis, Mo.; $10,000; machinery; by Charles A. Madill, Oliver H. Shroyer, and Rogers E. Bellecour.

The Graham Foundry Co., Erie, Pa.; $10,000; by Eugene Dunn, E. E. Graham, Alfred Gunnison, F. R. Bottsford, all of Erie, Pa.

The United Boiler Heating & Foundry Co., Hammond, Ind.; $20,000; by Otto Knoezer, C. H. Cass, Walter Williams, J. S. Blackman and W. C. McEwen.

The Ohio Shovel & Tool Co., Zanesville, O.; $10,000; by W. E. Lloyd, Elgar E. Bagley, Harry C. Myers, Bertie S. Young and A. M. Goodwin.

The Canadian Bond Hanger & Coupling Co., Ltd., of Ottawa, capital $45,000, to do business as engineers and founders; by Wm. C. Perkins, Moses C. Edey, Angus W. Fraser and others.

Charles Vreeland & Co., Paterson, N. J.; millrights, machinists, and genral iron business; $25,000; by C. Vreeland, C. J. Vreeland and R. Easton, Paterson.

The Victor Iron Works, Inc., The Bronx, New York City; $10,000; ornamental iron construction work; $10,000; by E. J. Forhan, H. M. Browne and J. J. Harper, all of 154 Nassau street, New York City.

The Garbutt Machine & Foundry Co., Ogdensburg, N. Y.; mechanical and electrical engineers and machinists; $10,000; by Max A. Jameson, Myron Gray, William D. Ingram, all of Ogdensburg, N. Y.

The E. M. F. Co., of Canada, Ltd., Walkerville, Ont.; by Franklin H. Walker, Jas. H. Walker, George E. Lindsay and others, to manufacture vehicles and boats controlled by electricity, gasoline, etc.

The F. Leu Co., Queens, New York City; $1,500; pattern, tool and machine shop; by Frederick Leu, College Point, N. Y.; Jacob F. Ortlieb, Long Island City; William Main, 604 Manhattan avenue, Brooklyn.

The Osterburg Tin Plate Co., Waynesburg, Pa.; $120,000; by I. N. Kuhn, R. L. Hoskinson, H. J. Scanlon, Harvey Call, P. D. Hoskinson, R. E. Kent, Ellis B. Bailey, James B. Huss and D. R. Huss Jr., all of Waynesburg.

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**New Construction:—**

The Burt Mfg. Co., Akron, O., has purchased the old Burger iron plant and will occupy it for manufacturing purposes.

The Stoever Foundry & Mfg. Co., Meyerstown, Pa., is making preparations for the erection of a large addition to its machine shop.

M. M. Madden has had plans prepared for a two-story brick machine shop to cost $3,000, at 118 South Breckenridge street, Buffalo.

The new chipping shop for the American Steel Foundries, at Chester, Pa., 40 x 50 feet, of brick construction, has been completed and will shortly be occupied.

E. B. Holmes Machinery Co., Buffalo, has completed plans for the erection of a two-story addition to its plant on Michigan street, 36 x 60 feet, estimated to cost $5,000.

The Sageng Threshing Co., Chicago, has taken out a building permit for a one-story brick foundry on University street, between Raymond and LaSalle streets, estimated to cost $3,000.

The Detroit Pressed Steel Co., which was newly incorporated at Detroit, has purchased 13 acres at Mt. Elliott and Strong avenues, at a price estimated to be in the neighborhood of $30,000.

Borg & Beck are erecting a building at Moline, Ill., to which they will remove their machine shop from East Moline. That portion of the machinery not now in use is being taken down for removing.

The Pennsylvania railroad's engineering department is preparing plans for shops to be erected next spring at Terre Haute, Ind., where a roundhouse with 25 stalls is now being built.

The American Steel & Wire Co. has taken out a building permit at Allentown, Pa., for an addition, 81 x 100 feet, to its barb wire plant. The new construction will be started in a short time.

The Chicago Ornamental Iron Co. has purchased two pieces of property on Thirty-seventh street, adjoining its plant. The company estimates that it will spend between $30,000 and $40,000 in erecting plant extensions on the new property.

The foundry destroyed at the state penitentiary at Salem, Ore., by fire last summer, has been rebuilt and is now ready for occupancy. The buildings will be occupied by Lavenburg, Going & Co., who will employ convict labor in the manufacture of stoves and ranges.

D. G. Langlands has arranged to remove his machine shop equipment from East Cambridge, Mass., to a site to be determined at Waterloo, Ia. When the site has been settled upon, construction of the new buildings will be begun immediately, as well as the removal of machinery equipment.

The Long & Allstatter Co., Hamilton, O., power punches, shears and agricultural implements, advises that owing to the heavy increase in its business—the large number of orders for heavy machinery for steel mill plants—it has decided to build a substantial addition to its plant to better accommodate the work.

Louis Sacks' Iron Foundry, Newark, N. J., gray iron castings, advises that the new building now under construction is a three-story brick structure, 40 x 110 feet. Other than the freight elevators, no equipment will be required for the building, as

it will be used for pattern storage, etc.

The Rockford Metal Specialty Co., Rockford, Ill., has been forced by increasing business to seek larger quarters, and it will locate in the Talcott building, where double floor capacity can be had. The officers of the company are: President, George Forbes; F. C. Rutz, secretary; and Orvid Anderson, treasurer and manager.

The American Tool Works Co., Chicago, with offices at 135 Adams street and plant at St. Joseph, Mich., advises respecting its recent fire at the plant that its reconstruction is well under way, and it expects to be running by the first of the month. The company desires to purchase complete a small machine shop, and is in the market for equipment such as shafting, belting, plating plant, punches, presses, etc., second-hand preferred.

The Lumen Bearing Co., Buffalo, brass founder, advises that its new foundry building measures approximately 60 x 90 feet. It will contain a five-ton hand crane for large work, and a scond story over half of the building, in which will be located a pattern shop and chemical laboratory. This laboratory will be equipped with all the latest devices for analytical work on non-ferrous metals requiring the greatest accuracy. The furnace equipment which will take care of the additional capacity will be furnished by Alfred Fisher, of Chicago. This building was made necessary by the company's increased business in manganese bronze and high grade red brass and Lumen bronze.

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**General Industrial:—**

The Moline Plow Co., Moline, Ill., has certified to an increase in capital from $6,000,000 to $7,000,000.

The Parkesburg Iron Co., Parkesburg, Pa., has increased its capital stock from $125,000 to $250,000.

The Aluminum Co. of America, Pittsburg, has filed notice of the increase of capital stock from $3,200,000 to $20,000,000.

Certification has been made by the Bethlehem Iron Mines Co., of New York, of increase of its capital from $250,000 to $1,000,000.

The Minneapolis Steel & Machinery Co. has entered an order for one of the largest types of Twin City Corliss engines to be set up by the company in the plant of the Albers Milling Co., Portland, Ore.

The capital stock of the Connellsville Iron Works, Connellsville, Pa., has been increased from $10,000 to $50,000, the additional stock being subscribed by the present stockholders. A lot adjoining the present plant has been purchased and additional buildings will be placed upon it.

Stockholders of the Bingham Mfg. Co., Shelburne Falls, Mass., which some time ago suspended business temporarily, have been discussing a proposition made by the Cameron Machine Co., of Brooklyn, N. Y., to take over the Bingham company, giving stock of the new company in exchange for Bingham stock.

The Bignall & Keeler Mfg. Co., Edwardsville, Ill., manufacturers of pipe threading and cutting machines, advises that October's business was the best in point of volume of any month in the year. Business is improving all the while, and the company's steadily reducing stock of pipe machines shows it. The company further advises that the prospects for next year are very encouraging.

George Teher, representing Pittsburg men who hold a controlling interest in the Wisconsin Engine Co., Corliss, Wis., has purchased the stock of the Owen Thomas Motor Car Co., which has been building cars at Janesville, Wis. The company will be reorganized, and the capital stock largely increased. The machinery will be moved to Corliss, where it will be installed in the Wisconsin Engine Co.'s buildings.

The Ballin Water Tube Boiler Co., Inc., Portland, Ore., whose incorporation was recently noted, advises that it has made arrangements with the Willamette Iron & Steel Works, of Portland, for the manufacture of Ballin marine boilers for use on the Pacific coast. So far, the Ballin company has not entered into any arrangement to manufacture for the eastern market, but is ready to entertain a proposition.

The Union Iron Works, Erie, Pa., steel boilers, advises respecting proposed increase of capital stock that the board of directors has voted for the increase from $100,000 to $300,000, but as yet the issue has not been perfected, and the new charter has not been received from the governor of the state of Pennsylvania. No building extensions will be made to the plant, but possibly some new machinery will be added.

The Sterling Electric Supply Co., Ltd., Toronto, whose incorporation was recently noted, advises that it is its purpose to carry on a general agency and an electrical supply business. It is representing in Canada, American manufacturers of electrical supplies, finding it possible to sell even after paying the customs duty. The company further advises that it is on the lookout for any new electrical supplies, which it is in a good position to handle.

On application of the Chicago Title & Trust Co., the affairs of the A. W. Stevens Co. of Marinette, Wis., manufacturers of agricultural machinery, have been placed in the hands of a receiver. The company has been in business about seven years but the business has always been restricted. The liabilities exceed $50,000. It is said that a new company is being organized to take over the plant. George A. Mitcheson, of Marinette, is receiver.

The Elby Rotary Engine Co., St. Louis, which was recently incorporated, advises that it will build rotary gas, gasoline and petroleum engines. Its 100-horsepower engine weighs 178 pounds, and is intended for aeroplanes and other air craft, although it holds that its high speed engine is very desirable for automobiles, motor boats, etc. The plans of the company contemplate establishing a plant in four cities, but the main plant will be located in St. Louis. The officers are: President and general manager, J. H. Tulley; secretary, P. R. Fitzgibbon; vice president, F. J. Curran, and treasurer, Thomas M. Gallagher.

The B. F. Brown Gas Engine Co., Syracuse, N. Y., advises as to its incorporation recently noted, that for the present it will confine its operations to the manufacture of marine gas engines, one to six cylinder, capable of developing from two to 80 horsepower. There is a possibility that in the future it will manufacture automobile engines. It has leased part of the Hall-McChesney building at Syracuse, and has about completed its equipment. No additional building will be done. It proposes to exhibit some of its engines at the National Motor Boat show at Madison Square Garden in February. The company has organized by electing the following officers: President, H. T. Hall; vice president, B. F. Brown; H. T. Gardenier, secretary and treasurer.

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**Fires:—**

The plant of the Canadian Iron Furnace Co., Three Rivers, Que., was damaged to the extent of $30,000 on Nov. 7.

The Valley Machine Co.'s shops, Underwood, Ia., were seriously damaged by fire Nov. 4. The loss is placed at $35,000.

Damage estimated at $65,000 done inflicted upon the plant of the W. F. Norman Sheet Metal Mfg. Co., Nevada, Mo., on Nov. 3. The company carried insurance to the amount of $15,000.